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ADDRESSES AND ORIGINAL ARTICLES

THE PSYCHOLOGICAL FACTOR IN CARDIAC PAIN

By Erich Wittkower, M.D. Berlin, L.R.C.P. Edin.

HALLEY STEWART RESEARCH FELLOW AND CLINICAL ASSISTANT AT THE TAVISTOCK CLINIC; CLINICAL ASSISTANT AT THE ELECTROCARDIOGRAPHIC DEPARTMENT, ST. BARTHOLOMEW'S HOSPITAL

(From the Cardiographic Department, St. Bartholomew's Hospital and the Tavistock Clinic)

In continuance of previous investigations on similar lines I welcomed the opportunity offered to me by Dr. Geoffrey Bourne to study the psychopathology of cardiac pain in the cardiographic department of St. Bartholomew's Hospital.

Normally we are not conscious of the action of the heart, but on excitement or exertion it may become noticeable in form of palpitation. Slight sensations in the heart region due to sudden emotional shock are a common experience in everyday life, and neurotic patients may have definite pain that cannot be accounted for by any anatomical cardiac lesion. The view is generally accepted that certain constitutional types of personality, certain races and professions are more prone to develop angina pectoris than others; it has also been known since the days of Heberden that emotions are as likely as physical effort to provoke individual attacks of angina pectoris.

Thus it appeared justifiable, first, to study the personality structure of patients suffering from cardiac pain before the onset of their complaint; secondly, to ascertain the emotional factor in the formation of cardiac pain; and, finally, to put forth a theory about the psychodynamics of this pain.

Personality of Patients suffering from Cardiac Pain

A survey of the relevant literature and an account of the material and the procedure of approach was given in a preceding paper* together with Dr. Bourne and Dr. Bodley Scott; the personality of the patients at issue was then dealt with. In that paper 57 cases of cardiac pain were investigated.

The present article deals with 73 patients suffering from cardiac pain (including cases of coronary thrombosis, valvular disease, cardiovascular syphilis, hyperpiesis, &c.) who were submitted to psychological examination. The additional 16 cases were patients with cardiac pain in whom the type of pain had not been personally classified by Dr. Bourne or Dr. Scott. They were not available therefore for the first paper, but are used in the present communication.

The psychological diagnoses of the patients were correlated in the first paper to the clinical diagnoses and the type of pain, according to Bourne's classification. It was found that the vast majority of patients suffering from cardiac pain, irrespective of the underlying organic cardiac disorder, consisted of psychoneurotics. Of 73 patients examined 48 were neurotics; the rest were melancholics, epileptics, cerebral arterio-sclerotics, and well-balanced persons. Those suffering from cardiac pain were contrasted with a control group of cardiac patients without pain. The majority of those without cardiac pain consisted of well-balanced persons and cerebral arterio-sclerotics; of 35 patients only 7 were neurotics. The predominance of psychoneurotics among patients suffering from cardiac pain in comparison with patients without cardiac pain is obvious. In accordance with common practice the psychoneurotic patients were classified into: anxiety states,† conversion hysteria, obsessional neuroses, and reactive depressions. Of the 48 psychoneurotics with cardiac pain 32 suffered from anxiety states and 8 from conversion hysteria; 3 were obsessional neurotics and 3 reactive depressives; while of 7 psychoneurotics without cardiac pain 4 suffered from anxiety states; 2 were hysterics, and one was a reactive depressive.

The frequency of psychoneuroses among patients suffering from cardiac pain suggests a possible connexion of the mental condition with the formation of pain. With this fact in view a further psychological examination of the group of 48 psychoneurotics suffering from cardiac pain was undertaken.

The Emotional Factor

Uniformly all the patients examined related that excitement brought on attacks of cardiac pain. The excitement was either due to personal involvement of the patient—e.g., arguments, unpleasant and startling news, laughing, bad dreams, sexual intercourse—or due to anticipation of happy or unhappy events, hurry to catch a train or bus, or due to identification of the patient with one of the participants of an exciting situation—e.g., an exciting novel, a tragic film, or watching a quarrel, or a football match. One patient, impressed by the sight of another patient in the same ward, developed attacks of angina innocens precisely on the day after the other had had attacks of cardiac pain.

EMOTION PRECEDING THE ONSET OF CARDIAC PAIN

In 36 out of the total number of 48 psychoneurotic patients examined emotional stress or strain, or a definite emotional trauma serious enough to be regarded as a precipitating agent, immediately preceded the onset of cardiac pain. In the remaining cases an initiating emotional upset was lacking. This might be either because there was no such disturbance or, because the emotional conflict was so deeply rooted in the neurotic personality that a single interview was insufficient to elicit information about it.

TYPE OF EMOTION

Examination of the nature of the initiating emotion shows that in 27 out of 38 cases it consisted of social, domestic, or sexual difficulties.

Economic.—In 9 cases serious financial reverses, failure in business, economic insecurity, loss of job, impending dismissal, or unsuitable occupation preceded the onset of pain.

A master mariner aged 68, very conscientious in his work, had to work under a new superior who for some reason or other disliked him intensely. The superior kept on finding fault almost every day and exposed the patient to the criticism of the managers of the firm. After a long connexion with the firm over many years the

* Published in THE LANCET last week.

† *Anxiety states* are conditions of morbid anxiety usually accompanied by physical symptoms. The anxiety states embrace anxiety neurosis, in which the anxiety is experienced by the patient primarily in the mental sphere, and anxiety hysteria in which somatic manifestations are prominent. *Conversion hysteria* is a mental disorder which finds expression in the form of bodily symptoms. The bodily symptoms are produced by the conversion of morbid anxiety, by the effect of suggestion, or as the result of some idea in the sufferer's mind which is usually purposive though dissociated from conscious purpose. *Obsessional neuroses* are conditions in which ideas or emotions constantly recur in the mind of the patient without adequate reason, or in which there is a sense of compulsion to some activity, usually purposeless, and always symbolic (Gordon, Harris, and Rees, 1936). *Reactive depressions* are conditions where the exciting cause is obvious.

patient had to face disgraceful dismissal. With his growing anxiety severe attacks of angina innocens started which subsided when the patient eventually retired. On examination no cardiac disorder was found that might account for the pain.

A man, aged 68, had been in the drapery business all his life. He had a warehouse in the City of London and had made a good living. In 1925 with the general slump he could not make any profit. Gradually an anxiety arose about bankruptcy, and with the matter always in his mind he suffered from headache, sleeplessness, and tremor, and was very depressed. He feared he might become dependent on his children, and that his children might not be able to keep him. With the growing anxiety severe attacks of angina of effort developed.

A man, aged 74, a pianoforte maker, achieved his ambition and built up a business of his own by industrious work. Cheated by a partner some years later, he went bankrupt. With the idea of committing suicide, he tramped about all night without finding the courage to do it. In the course of this night he developed his first attack of angina pectoris. His friends rallied round him and made him managing director of the firm, and he recovered; but after a second bankruptcy some years later he relapsed. On examination angina of effort was found.

Domestic.—Illness or death of a loved person, disappointment in married life, dissension in the family, impending divorce or fear of punishment to members of the family constitute the initiating cause in 10 cases.

A woman, aged 43, was married unhappily from the start. Her husband used to drink and knock her about, and there were quarrels almost every day. After the rows and sometimes without them she got fits of trembling all over her body. One of her sons suffered from heart trouble three years ago and had attacks of heart pain; his death in her arms was followed by a nervous break-down, and attacks of angina innocens developed for which no organic explanation was found.

A woman, aged 52, married when she was 25. Her marriage was unhappy from the beginning. Her husband was violent and knocked her about, kicked her during pregnancy, and threatened to kill her and the baby. Sexual intercourse was utterly repugnant to her. She was in constant fear of him, expecting some trouble every-day, and when she saw him she used to tremble. Frequently she fled from the house for fear; twice she got a legal separation on grounds of mental cruelty, but as she could not earn her living, she had to go back. On her return to her home, her cardiac pain started. On physical examination angina of effort was found.

A carman, aged 60, suffering from syphilitic aortitis, contracted syphilis when he was 18, which he had concealed from his wife for fear of divorce. After two miscarriages his wife gave birth to a son who at puberty started to have mental changes due to hereditary syphilis, since when the idea has preyed on his mind that he has sent a child into the world to suffer through him. With a constant fear of being found out, with strong feelings of guilt on account of his infected son, with a fear that his other children might be infected constantly at the back of his mind, he saw a film demonstrating the results of syphilis. His anxiety worked up to a peak, and on leaving the cinema he was seized by his first attack of severe cardiac pain, which has returned on and off ever since.

Sexual.—Actual sexual conflicts played an important part in 7 cases.

A woman, aged 57, married when she was 20 years old, and has been unhappy all along. After 5 years of married life she left her husband. Shortly afterwards she was taken ill with rheumatic fever, and when she was 30 she and her husband were reconciled. For a couple of years they were happy together, but then quarrels began again, and they separated a second time. Now, approximately coinciding with the menopause a number of nervous symptoms developed; she got miserable, depressed, cried a lot, and had falling attacks, and she was treated for neurasthenia. Against the will of her family she came together again with her husband, when she was 46 years old. After two attempts they abstained from intercourse because she had a tight feeling across the chest, as if she was being strangled. Physical diagnosis: mitral stenosis, angina innocens.

An export merchant, aged 54, a self-conscious patient, early repressed in his sexual and aggressive impulses, was impotent after marriage with a woman of a better standing. With the onset of impotence periodical anxiety states and fits of depressions set in. Usually his anxiety was apparently causeless—at times there was a fear of going insane, accompanied by heaviness of the heart. He was very depressed and suffered from lack of concentration, tiredness, sleeplessness, and constipation; 6 years ago he began to have attacks of pain near his heart, usually brought on by effort or by anticipation of effort—e.g., hurry to catch a train or bus. Attempts at intercourse then became less frequent until they went without it for months. At the same time a change in their personal relationship took place; his wife "mothered" him more and more. With the onset of pain his anxiety attacks have subsided; "Apart from the pain I have never felt so well." Physical diagnosis: angina of effort.

In some cases it is possible for the knowledge of the existence of organic heart disease with its symptoms and signs to act as a psychical trauma sufficiently strong to precipitate the onset of cardiac pain. Arteriosclerosis, hyperpiesis, valvular disease, are nowadays common fireside topics to which popular medical books, lectures, press, and wireless have largely contributed. "Most persons who would accept with considerable equanimity the knowledge that they have some disease of the liver or kidneys or lungs will have their morale sadly shaken by any evidence that the heart is not functioning properly" (Conner, 1930.). Knowledge about the vital function of the heart and that its stopping means instantaneous death is so deeply rooted in the minds of everybody that symptoms or signs of cardiac disorder will mobilise a fair amount of fear in the most stable person. So, in the predisposed person, the diagnosis of angina pectoris, the advice or even the silence of a physician may result in an acute anxiety state, which may provoke or maintain cardiac pain; this all the more if the cardiac disorder, as in the case of coronary thrombosis, is accompanied by intense cardiac pain and fear of impending death, or if the cardiac disorder seriously interferes with the occupation, social, or sexual activities of the person affected. These cases are so common that it is hardly necessary to give many illustrations.

A married woman, aged 57, lost both parents from heart failure, her father suffering from cardiac asthma. Her early history abounds with anxiety symptoms and hysterical manifestations. When 21 she was taken ill with rheumatic fever. Four years ago she had a relapse of her joint complaints in the course of which she suffered from shortness of breath. Since the beginning of her heart trouble she gets depressed, irritable, and emotionally unstable; the least things make her cry. She suffers from headaches, sleeplessness, and is easily fatigued. She imagines she has the same disease as her father, and is afraid that she is going to die very soon. A number of other fears developed: fear of being alone, fear of crowds, fear of escalators, &c. With the growing anxiety attacks of palpitations, bouts of collapse, and shooting pains in the heart region started.

Similar cases have been reported by Stewart Roberts (1931), Soma Weiss (1932), Fahrenkamp (1931), von Wyss (1931), and many others.

THE SPECIFITY OF THE PRECIPITATING EMOTION

The observations related so far, given briefly and divested of the whole life history of the patient, show that the onset of cardiac pain is frequently

preceded by traumatic events or conditions that endanger health. The nature and seriousness of these events—in the cases cited—justify an emotional reaction. The degree of this reaction will largely depend on the personality of the individual concerned; and an event that will provoke a severe emotional reaction in one subject will leave another hardly affected, if at all. But even the evidence of a severe emotional disturbance, strongly suggestive as it may be in favour of a psychological origin of a complaint, is of little avail as a definite indication of its "psychogenesis" since traumatic events, unpleasant situations, and emotional reactions due to them unfortunately occur in the lives of every human being. So the mere discovery of emotional experiences preceding the onset of cardiac pain is, as stated by Flanders Dunbar (1936), of little significance for its "psychogenesis."

Support for the conception of a psychogenesis of a complaint may, in theory, be obtained if the isolated complaint at issue, the cardiac pain, is considered in its setting of concomitant psychological symptoms and if on exploration of the pattern of reaction to previous emotional experiences, before the onset of the present complaints, there is found an abundance of mental and physical symptoms whose neurotic origin is beyond any doubt.

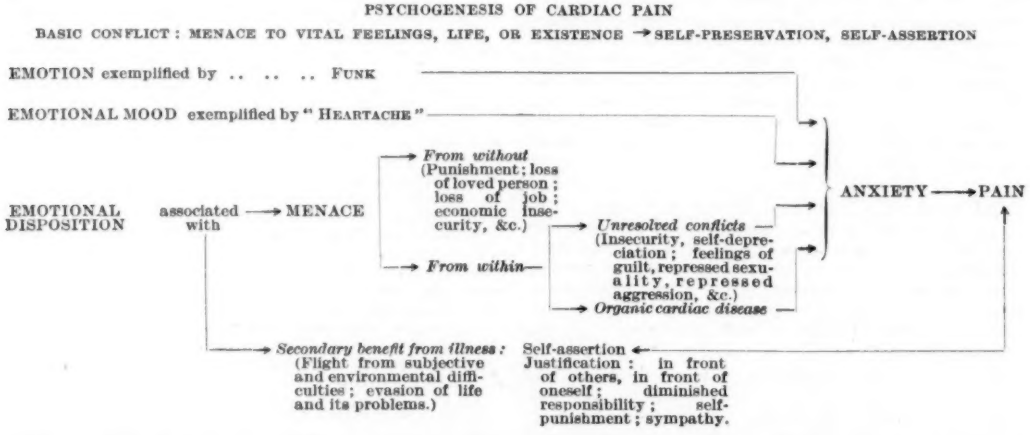
It has been shown above that the overwhelming majority of patients suffering from cardiac pain are latent or manifest neurotics. But the crucial test as to psychogenesis would be if the onset of the cardiac pain, like that of other neurotic phenomena, could be connected to a specific situation in the life of the neurotic patient when he, confronted with a difficulty or frustration to which he is unable to adapt himself, looks for new possibilities of a substitute gratification. "The external frustration in itself need not have any pathogenic effect; it is only when the external conflict transfers its scene of action from the outer world to the inner world that the inner conflict —the neurosis—arises" (Helene Deutsch 1932).

A man, aged 60 years, was born and brought up in Russia. At school he was one of the best and was always a "swot." On leaving school he studied chemistry and after a short period of scientific work turned to business. His marriage in 1918 was happy and remained deliberately childless. His business life was very successful. He was the managing director of four companies, 2700 workers working in his factory and altogether 6500 workers working under him up to 1918. He worked very hard, made a lot of money, and had many women friends. With grim determination he overcame all the difficulties of the Russian revolution. He negotiated with over 10,000 workers, with the head officials of the Soviet, always emerging successfully. After a very eventful time—arrest by the police, sentenced to death, &c.—he escaped from Russia. All this time he was "like iron." He then tried to build up a new life and ultimately succeeded in forming a company. In 1932 the business was not doing well, owing to mistakes of his partners, but by the aid of a loan he was able to buy them out although he had to pay the money back within six months. He started to run the factory on his own. Soon, however, he discovered that his partners had made a large loan without his knowledge and he was unable to repay the first loan. The bank sent a receiver and appointed him manager of the business. On the day when they sent the receiver he was very ill all day. For the first time he felt a terrific pain across the chest, extending into the right arm. He worked all day and night, and all the time at the back of his mind was the fear that he might go bankrupt. One day, in 1934,—he was ordered by the County Council to stop work in the factory because there was too much noise at night. This was the end. The bank and his creditors wanted him to go on with work, the Council wanted him to move; the bank refused to allow him to move because the factory would not be working for three months. There was no way out, and he made a voluntary liquidation. In October, 1934, he paid out his whole account to the last penny; the factory had to close down; he was absolutely penniless and workless. In the excitement of these days he complained of tiredness, weakness, his legs seemed to give way, he suffered from pain in his calves. This kept on for some months until after another failure it came to a final break-down in the spring of 1935. At the time he was very depressed, he worried continuously. He had lost his job, had lost everything; he considered suicide. He could neither talk, sleep, nor eat. He lost 3 stone in about five months. The slightest noise, knocking at the door, ringing of the telephone bell made him jump and tremble all over. He was sitting up in his bed all day and night. The slightest movement brought on attacks of cardiac pain. Gradually he recovered his courage and his strength. Now he is able to see people, and to talk, to eat and sleep, and feels more cheerful. His cardiac pain has subsided. Physical diagnosis: essential hypertension, spasmodic angina, old coronary thrombosis.

Here is a patient who in the course of a long and adventurous career met with a large number of the most varied set-backs from which he managed somehow to emerge successfully and who, eventually, when confronted with a frustration which he is unable to surmount or to tolerate, develops a number of hysterical symptoms, among others, attacks of angina pectoris.

A married woman, aged 25 years, is the only child of the first marriage and has a step-brother and a step-sister many years her junior. She adored her mother and was very fond of her step-father, who took her out and treated her as a friend. As a small child she was strong and healthy, but when aged 10 she suffered from rheumatic fever, with a relapse and chorea at 15, her heart being affected. On the whole she was happy and jolly. At 10 a period of sleep-walking; up to 14 she was a bed-wetter. She was very lively, always on the move, preferring boyish games. She would rather have been a boy. She was very mischievous and wanting to be the leader, anxious for the praise of others, could not bear to be criticised or to make enemies. If anyone laughed at her she became sulky, used to go by herself and have a good cry. She felt inferior to people who knew more than she did and had in general a grudge against anyone who had what she had not got. Consequently she was from early childhood onwards very ambitious, wanted to get above people, wanted to be a leader, and wanted to be above the working class from which she originated. At school she was medium and left in the top standard. Her periods started when she was 14; they were regular and not painful.

After leaving school she went as a factory girl into a dressmaking factory. But driven by her ambition and unable to get on with her fellow-workers she left after a short while. The other girls took things easily, swore and talked freely of sex. She took things seriously, wanted to get on, detested swearing and was bashful about sexual matters. Marriage was not for her an important thing. The others stopped talking about these things when she was there. Her fancy for reading books was ridiculed by the others who called her a book-worm. She left and went to a shoe factory where she got on better, but not as quickly as she ought to. When 17 she went as a counter hand at a restaurant and wanted to become a waitress; as she was told, however, that she had to work her way up from the kitchen, she left. She went back to factory work; this time as a machinist and was very anxious to become a forewoman. Early in 1936 she married, and shortly after the wedding trouble arose. Her husband was passionate, she loathed intercourse. What made matters worse was the fact that her husband was devoid of ambition; he did not care if he was working or not. A month after her marriage her step-father died. The excitement of her marriage, the disappointment about her husband, and the death of her step-father were too much for her; some days after her step-father's death she broke down, fainted frequently, and used to sit down and cry,


PSYCHOGENESIS OF CARDIAC PAIN
BASIC CONFLICT: MENACE TO VITAL FEELINGS, LIFE, OR EXISTENCE → SELF-PRESERVATION, SELF-ASSERTION
EMOTION exemplified by .. .. .. FUNK
EMOTIONAL MOOD exemplified by "HEARTACHE"
EMOTIONAL DISPOSITION
associated with
MENACE
From without (Punishment; loss of loved person; loss of job; economic insecurity, &c.)
From within
Unresolved conflicts (Insecurity, self-depreciation; feelings of guilt, repressed sexuality, repressed aggression, &c.)
Organic cardiac disease
ANXIETY → PAIN
Secondary benefit from illness: (Flight from subjective and environmental difficulties; evasion of life and its problems.)
Self-assertion
Justification: in front of others, in front of oneself; diminished responsibility; self-punishment; sympathy.

and had to go to bed for several weeks. Whitsun, 1936, she left her husband; she tried living with him again, but it failed and she left him finally in July, 1936. In August of that year her present complaints started. While bending down she had a dull pain in the heart region which gradually worked across the chest. Since October she has suffered from shortness of breath on walking. Physical diagnosis: mitral stenosis, angina innocens.

The history of this patient reveals from early childhood onwards a discontent with her own feminine rôle, leading to repressed sexuality and ultimately resulting in frigidity. Her strong drive, her ambition, her desire to be above the working class from which she originated, seems to be due to an over-compensated feeling of inferiority. She works off her psychic energy in her increased occupational activity, and finally breaks down when, after marriage, a twofold clash between wishes and attainments, and inhibitions and demands of married life takes place.

From psycho-analytical quarters the objection may be raised that this superficial study, insufficient as it is, falls short of giving a real insight into the emotional life of the patients concerned and that only by the penetrative procedure of psycho-analytical approach can their neurotic structure be elucidated. Because, however, of the enormous amount of time required for each case, and cardiac patients come rarely under the scrutiny of psycho-analysis, hitherto the number of cases examined by psycho-analysis is still very small. Some observations have been reported by the Menningers (1936)—who quote French and also Alexander—Wolfe (1934), and Elmore (1936). Admittedly the interview method has its shortcomings but the data, which are considered more as a suggestion than as an established fact, may act as a stimulus for psycho-analytical research.

The Psychodynamics of Cardiac Pain

Summing up, it has been shown that in a group of neurotic patients with or without organic lesion of the heart a traumatic event may precipitate neurotic manifestations including cardiac pain, ranging from simple pain to angina of effort.

THE ESSENTIAL RÔLE OF ANXIETY

A glance at the diagram reveals that the factor common to all precipitating causes is a menace to vital feelings, life, or existence. The menace may originate in the outer world and consist of financial reverses, failure in business, impending dismissal, loss of job, disease, or death of a loved person, disappointment in married life, dissension in family, &c.; it may be due to a serious organic disease which interferes with occupational, social, or sexual activities of the person affected; or it may originate in the inner world and be due to the presence of repressed unfulfilled desires incompatible with the self-respect of the person concerned. But even if the menace originates in the outer world it is generally agreed that the emotional tension, the anxiety, which results from the conflict between menace to vital feelings, life and existence on one side, and on the other self-preservation and self-assertion, ultimately goes back to repressed incidents of a strongly emotional content in early childhood. The current conflict between aims and frustrations is, in the analytical conception, only a revival of the basic neurotic conflict between infantile instinctual urges and the repressing super-ego. As a response to the danger from within or without the patient develops attacks of apparently causeless anxiety, phobias, or other psychic equivalents of anxiety; or he transmutes and discharges his anxiety by somatic phenomena familiar as accompaniments of anxiety—e.g., bouts of palpitations—or he renders the anxiety innocuous by conversion into cardiac pain, dissociating the symptoms from the rest of the personality; so both the patient who displays the characteristic "belle indifference" of the hysteric (Janet) and the doctor lose sight of the psychogenic origin of the symptoms.

A case demonstrating the gradual conversion of anxiety into palpitations and pain may be reported.

A man, aged 61, was a cabinet joiner; his father, a heavy drinker and a hasty tempered man, died when the patient was 11 years old. From early childhood he was over-attached to his mother who was even tempered. He was quiet, shy, and sensitive, and at school he was always top of the class and took several prizes; he left school in the seventh standard, after which he was an apprentice to a joiner's firm. He was always over-conscientious in his work and severely hurt by criticism. At 18 he realised his ambitions and became a soldier. He was daring and efficient, but left the service thoroughly disgusted by the "death and glory" atmosphere and frightened by the idea of another war. When he was 27, he married and settled down as a cabinet joiner. His married life was happy; he had 4 children.

The first symptoms of his present complaint started during the late war. During the air raids he was seized with a panic, used to run and hide, and had severe attacks of palpitation. Similar attacks of palpitation were brought

on by smoking. The attacks increased in intensity and frequency after the war, and they were now associated with stiffness of the fingers. When sitting in a smoking compartment of a train he had to keep his handkerchief in front of his mouth because the smoke caused palpitations. A number of fears developed: of accidents, of crowds, of crossing roads, of crossing open spaces, of looking down from a height, of diseases, of animals. If there was a quarrel or an accident he had to walk to the other side of the street. He kept out of crowds, afraid something might happen to him. He stopped travelling underground for fear it might crash—"it is 64 feet below the earth." Crossing roads or open spaces brought on palpitation. If there was an epidemic of 'flu he felt sure that he would take it, he was afraid of going near a horse, and was frightened by dogs. An inexplicable fear that something was going to happen overtook him. The condition grew gradually worse and during the last 7 years his attacks of anxiety have been accompanied by cardiac pain. Beginning about the same time he noticed an impediment of speech. He is very much alarmed about his cardiac pain. "The heart is the engine of the body, once it stops working everything must stop." He cannot run, he cannot walk; everything points to a fatal disease. As his various fears increase he is afraid he may lose his reason. Clinical diagnosis: essential hypertension, angina innocens.

SECONDARY BENEFITS FROM ILLNESS

The unconscious aim of the cardiac pain—contributory in its formation and common with other manifestations of conversion hysteria—is to avoid anxiety and to gain an end otherwise unattainable by the patient. By means of his "flight into disease" the patient evades his subjective and environmental difficulties and in addition, as a "secondary benefit from illness," secures self-assertion and justification in front of others and himself. He exchanges the distrust and bewilderment generally provoked in the onlooker by psychical symptoms for the tenderness, attention, and sympathy generally displayed towards a physically diseased person. Two cases especially illustrating this may be given in short abstracts.

A man, aged 47, an obsessional neurotic, suffers from fear of being held and not able to move, of being trapped, of being buried before he was dead, of disease: if someone says that his mother died from cancer he would fear contact with him—afraid of germs since a teacher at school told him about the spread of diseases by dust. When he is invited out to a dinner-party, he looks carefully on the plates and every utensil on the table; if he discovers dust on any of them, he passes them back "there are millions of germs." He often got into trouble on account of this. He tries to get into the lavatory without touching the handle. Washing compulsion: his wife says he washes himself away. Counting compulsion: his favourite figure is 8; the sum of his birth date is 35 which added up again is equal to 8, so that Jan. 23rd, 1937, was one of his lucky days because its sum is 8. Although he does not want to, and is not religious, he feels compelled to recite the Lord's Prayer whenever his brain is empty. He never visited the grave of his mother, because if he did so he would lose someone near to him, &c. At 26 he married. From the very beginning he had trouble with his wife because he was exceedingly jealous. She was never allowed to go out by herself. His wife left him on two occasions on account of his jealousy. During arguments he got a sharp pain in the region of his heart; he used to think "she is breaking my heart." His actual trouble started 3 years ago. At the time his wife suffered from kleptomania; she was arrested for stealing an article and sent to prison for two months. The whole affair was hushed up; he told people she was in hospital, but all the time he was in constant fear that it would be found out. It was a disgrace. "I cannot stand disgrace." He became terribly down-hearted. When she came out of prison he was in constant anxiety that she might do the same thing again; moreover she did not care about the house and began to drink. Worried about his home affairs he neglected his business. He had to see that the firm was never short of material. At the time he failed. If anyone failed in his job he was ruthlessly dismissed. He had seen it happen very frequently. He was afraid he might be the next. His anxiety gradually worked up to an acme. Cornered in a situation where there seemed to be no way out he developed dramatic attacks of cardiac pain, with the result that he did not get the sack from business, and his wife gave up drinking and stealing. In business his failure was put down to his disease, and he was sent to a doctor. His wife, frightened by the thought that she was going to lose him, and that his condition might be due to her fault, changed her attitude altogether. She became very considerate, looked after the house and did not steal or drink any more. Clinical diagnosis: essential hypertension and spasmodic angina.

A married woman, aged 38, discovered in 1932 that her 16-year-old son had got into bad company. He was a good boy before; now, however, together with two friends he began to steal and break open machines. He was put on probation, but during this time he did the same thing again. He was sent to a remand home attached to the police station for two weeks. Eventually, in October, 1933, the boy was sent to an approved school and was kept there for a year and nine months. When the patient first came to the police station she was trembling all over her body and her legs seemed to give way. Her heart was throbbing up to her neck, she had a feeling of tightness in the upper part of her stomach. She was afraid her boy might be sent to prison. She and her husband were decent all their lives and this was a disgrace. She blamed herself for having neglected the boy; she ought to have brought him up better; she ought to have looked after him instead of doing work from morning till night in the laundry. "It nearly broke my heart." She considered suicide. She worried about it for months afterwards, always in anxious expectation that some trouble might be ahead. When there was a knock at the door she jumped, her legs gave way, she was unable to open the door, always thought a policeman might be there. She was apprehensive that the affair might become public, it might be in the local paper, she might lose her job in the laundry; it might harm her husband's business. Gradually her anxiety worked up to such a pitch that she could not be alone, lost her appetite, became sleepless and "awfully thin." She had no confidence in doing anything, was trembling, quite unable to hold a teacup and suffered from a horrible feeling of tightness across the upper part of her stomach. Although she knew that it was absolutely silly, she had a constant impulse to cut her fingers, and did so on one occasion. When walking along the street she always had the fear that someone would come up behind her and hit her on the head. She had no confidence in crossing roads, she used to shake, and had a feeling like cold water running down her back. She was a hard worker before, now she easily got tired. Everything seemed too much for her. At Christmas, 1935, apparently without any obvious reason her attacks of cardiac pain started. As she thought she had overworked herself, she gave up her work in the laundry, in the hope that working at home might give her relief. But instead of getting better the pain got worse, so that eventually she ceased working altogether. Since she has had rest, she feels better in herself, but the pain has become worse. Incidentally, the beginning of her pain at Christmas, 1935, coincides with the return of her son. Clinical diagnosis: syphilitic aortitis.

The coincidence of the beginning of the attacks of cardiac pain with the return of her son suggest that the purpose of the cardiac pain was to give the patient a plausible excuse to stop work, to stay at home and look after the son.

The Mechanism of Conversion

There remains the problem why the heart is chosen as a site of hysterical manifestations, and how, in particular, the "mysterious leap from mental to bodily symptoms" (Ferenczi) is effected.

SYMBOLIC FUNCTION OF THE HEART

Every attempt to interpret the conversion of anxiety into cardiac pain necessarily starts from the

close relationship between feelings and heart. There are terms in all languages referring to the heart as an organ expressing feeling and character. We talk about "hard hearted," "soft hearted," "kind hearted," or even "heartless" people. The heart is the organ of sympathy. We talk about "heartfelt" sympathy. Courage is localised in the heart. Courageous people are spoken of as "strong hearted," cowards as "chicken hearted." The heart may be "bursting" with joy; grief "gnaws" at the heart; distress may "rend" or "break" the heart. So in common language the heart symbolises the gist of the personality, the feelings, the affectivity and character qualities of a person.

In accordance with common usage "heartache" in patients with or without an organic lesion of their heart may be a symbol, as recently pointed out by Halliday, which signifies that the feelings of a person have been severely hurt, that a person has been exposed to prolonged emotional stress, or that an individual feels himself threatened.

PARS PRO TOTO

Slightly different is the mechanism if the whole self identifies itself with the heart. As already pointed out, the vital importance of the heart function is common knowledge. Everybody knows that the stopping of the heart means instantaneous death. So it becomes understandable that the heart more than any other organ is apt to be used as a representative of the whole personality, and also, that the anxiety resulting from a menace to vital feelings, life, or existence is likely to be focused and condensed on the heart. The whole process is probably nothing more than a gross exaggeration of the slight cardiac sensations which occur in everyone in everyday life as a result of sudden emotional shock.

PHYSICAL MISINTERPRETATION

In addition the apparently causeless anxiety which overtakes the patient gives rise to a feeling of uneasiness and oppression, and so, as stated by J. Schultz, Kronfeld, v. Wyss, Christoffel, Foster, and others, the bewildered patient, at a loss to understand what is going on in himself, refers, in a search for a plausible explanation, his abnormal condition to a localised physical disease. Thus the misinterpretation of a sensation, the "somatic misunderstanding" (Schultz), and the faulty idea of reference results in the provocation of cardiac complaints.

LOCUS MINORIS RESISTENTIÆ

Finally it goes without saying that an anatomical lesion of the heart—the "organ inferiority" of Adler, the "somatic compliance" of Freud—both by itself and by focusing the attention of the patient on the diseased organ predisposes and facilitates the shunting of the emotional streams along the line of least resistance. This all the more if the cardiac disorder —e.g., in coronary thrombosis—is accompanied by symptoms of organic origin arising in the cardiac area. The pain pathway once established is liable and likely to be used more easily and again.

Summary

1. A series of 73 patients suffering from cardiac pain were examined from the organic and psychological point of view. Irrespective of an underlying organic cardiac disorder, 48 of these were found to be psychoneurotics; this group was submitted to further psychological exploration.

2. The emotional factor in the formation of individual attacks and the onset of cardiac pain was examined. In the majority of patients examined cardiac pain seemed to be a manifestation of conversion hysteria.

3. A theory about the psychodynamics of cardiac pain is put forward.

4. The application of psychotherapy appears justified in selected patients suffering from cardiac pain, certain cases of angina of effort included.

I wish to express my indebtedness to Dr. Geoffrey Bourne for permission to investigate patients under his care and for his kind suggestions. I wish to thank Dr. J. R. Rees, medical director of the Tavistock Clinic, for the facilities given to me at the Clinic, and finally I am extremely grateful to the Halley Stewart Trust for enabling me to carry out these investigations.

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THE ACTION OF NORMAL AND DIABETIC SERA ON ANIMAL LIVER GLYCOGEN IN VIVO AND IN VITRO

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IN a recent study of the "diabetogenic" action of the sera of diabetic patients we produced evidence that the sera of certain diabetics rendered rabbits relatively insensitive to insulin (De Wesselow and Griffiths 1936). The only work along similar lines with which we are acquainted is that of Boller, Uiberrack, and Falta (1934), and of Anselmino and Hoffman (1935).

Boller and others found that as a result of transfusion of 300 c.cm. of blood from a normal subject after a carbohydrate meal into an insulin-sensitive diabetic, the blood-sugar of the recipient fell over a short period; blood removed from diabetics, whether sensitive or resistant to insulin, did not produce this effect. Further, they found that blood from normal and insulin-sensitive patients half an hour after injection of 20 units of insulin reduced the blood-sugar of a sensitive diabetic recipient, but they were unable to detect the presence of insulin in the blood of resistant diabetics by this method. They concluded that insulin-sensitive patients suffer from an insufficiency of insulin, and that their failure to detect the presence of injected insulin in the blood of the resistant patient might be due to the existence in their blood of a substance in

the nature of an antibody, which paralyses the activity of insulin.

Anselmino and Hoffman (1935) found that the injection of diabetic serum into rats was followed by a diminution in the liver glycogen of the animals, much greater than that observed after the injection of normal serum. They had already claimed to have isolated from the anterior pituitary by ultrafiltration at *p*H 5·4 a "carbohydrate hormone" which lowered the liver glycogen of rats by 50–90 per cent. within two hours, and diminished the fatty-acid content of the liver, but which did not affect the blood-sugar. This hormone they believed to be distinct from their "fat metabolism hormone" of the anterior pituitary, obtainable by ultrafiltration at an alkaline reaction, which produced an increase in the ketone bodies of the blood, and in the unsaturated fatty acids of the liver in rats, but which had no action on the liver glycogen. Examining the blood of diabetic individuals, mainly long-standing, they found that 3 c.cm. of the fasting serum produced a very definite fall in the liver glycogen of the rat, and a rise in the ketone content of the blood; the sera of normal individuals on the other hand had only a very slight effect on the glycogen content of the liver and on the blood ketones. The effect on the blood-sugar was not mentioned.

In view of the possible bearing of Anselmino and Hoffman's findings on our own work on the effect of injected diabetic serum on the response to insulin of the rabbit, we have attempted to confirm their results. We had in mind, first, to study the effect of diabetic sera in general on the liver glycogen, and, secondly, to determine whether "diabetics" were, as in our own experiments, divisible into two groups. In our experience the serum of certain elderly, obese diabetics exercised an inhibitory effect upon the fall of blood-sugar following intravenous injection of insulin into the rabbit, while that of young diabetics had no such action. It had seemed to us that the rapid recovery from post-insulin hypoglycæmia, which occurred in animals injected with the sera of elderly and obese diabetics, might be due either to the presence of some substance which directly inhibited the action of insulin, or possibly to the presence of a glycogenolytic body resembling the active principle of the anterior pituitary, described by Cope and Marks (1934), which acts as a synergist to adrenaline in liberating liver glycogen. In the latter case the work of Anselmino and Hoffman (1935) had a direct bearing upon our findings.

METHODS

We have used male rats, 150–250 g. in weight.

Each animal received a daily ration consisting of 10 g. crushed wheat, 3·5 g. Glaxo, and 5 g. glucose, made into a mash with water. In addition they received carrots, a little greenstuff, and occasionally cod-liver oil. Before being used for an experiment the rats were placed for at least 4 days in an incubator under thermostatic control at 70° F. After injection of the serum both test animals and controls were returned to the incubator and deprived of food until the time of killing, since it was possible that the discomfort of the injection might lead to the injected animals refusing food while the controls continued to eat. The serum was obtained from fasting normal and diabetic individuals, and was injected within a few hours of bleeding. The animals were killed by a blow on the head three hours after the serum injection, bled out from the neck, the liver rapidly removed, weighed, and transferred to boiling 40 per cent. potassium hydroxide; the glycogen was estimated by Pflüger's method, three volumes of absolute alcohol being used for precipitation. At least two controls were used in each experiment, our usual practice being to use 2 controls, 2 rats injected with a normal, and 2 with a diabetic serum in each test. Blood-sugar was estimated by MacLean's method.

Our controls showed a rather lower percentage of liver glycogen than those of Anselmino and Hoffman, which was to be expected in view of the three hours' fast before killing. We agree with Cori (1930) that considerable variations occur in the amount of glycogen in rats' livers, even when the animals are kept under standard conditions, but we believe our groups to be of such a size as to warrant significance being attached to the results obtained.

To test the effect of the discomfort of the injection on the liver glycogen, 5 rats were injected with 3 c.cm. of normal saline subcutaneously, killed 3 hours later, and their liver glycogen compared with that of 5 controls. The average liver glycogen of the injected animals was 3·1 per cent. (3·0, 3·8, 3·8, 3·2, and 1·8 per cent.) as against 3·0 per cent. (3·2, 2·9, 2·7, 3·2, 2·7 per cent.) for the controls. The average value of the blood-sugar at the time of killing was for the controls 0·125 per cent., and for the injected animals 0·122 per cent.

The injection qua se is therefore without effect on the liver glycogen and blood-sugar.

EFFECT OF INJECTING DIABETIC SERA

The effects of injecting normal and diabetic sera on the liver glycogen and blood-sugar of the rats are shown in Table I. It is obvious that, though in all these groups the liver glycogen of the injected rats is lower than that of the corresponding controls, the reduction in each group is approximately the same—38 per cent., 37 per cent., and 42 per cent. The property of reducing the liver glycogen is therefore in no way peculiar to the diabetic sera. Further, sera obtained from the same patient on different occasions may show very different glycogen-reducing powers. In one young diabetic, for instance, the first serum examined reduced the liver glycogen by 11 per cent. only, the second by as much as 74 per cent. We were unable to correlate these differences with any corresponding change in the patient's metabolic condition. The one fact that emerges is that injection of human serum into rats is followed by a fall in the liver glycogen of the animals, but we are quite unable to confirm the statement of Anselmino and Hoffman (1935) that this fall is more pronounced after injection of the serum of the diabetic patient.

TABLE I

Effect of Normal and Diabetic Serum on the Liver Glycogen of the Rat

(Average values for liver glycogen and blood-sugar are given)

—	Cases.	Rats.	Liver glycogen.	Blood-sugar.
			g. per 100 c.cm.	
Elderly diabetics ..	4	8	1·76	0·063
Controls, uninjected ..	..	6	2·72	0·096
Young diabetics ..	8	21	1·99	0·098
Controls, uninjected ..	..	19	3·12	0·098
Normals	9	21	1·52	0·102
Controls, uninjected ..	..	19	2·58	0·099

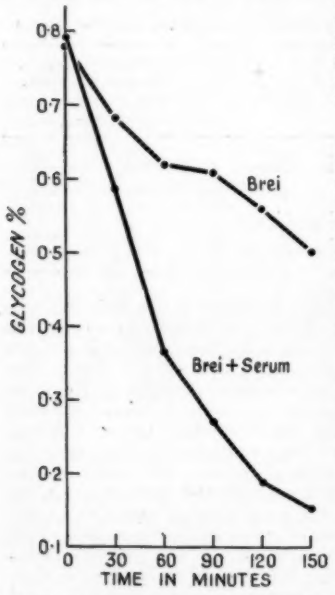
The blood-sugar of the animals, estimated at the time of killing, is not apparently affected by the serum; in the first group the blood-sugar is lower in the injected animals, but in this small group two very low values occurred, and we would place more emphasis on the two larger groups, comprising 80 animals, in which the blood-sugars of the injected and uninjected animals show excellent agreement. The blood-sugar figures do not suggest that any excessive glycogenolysis, with discharge of sugar from the liver into the blood stream, was occurring at the time of killing. We have already noted that the

injection of diabetic serum into rabbits, though in some cases it affects the response to insulin, does not alter the blood-sugar estimated three hours after injection.

In view of the possibility that the activity of a humoral mechanism regulating the discharge of liver glycogen might vary with the patient's metabolic condition, we have studied the effects of variations in the patient's blood-sugar level on the capacity of his plasma to reduce the animal's liver glycogen. The plasma of normal individuals in the fasting state was found to reduce the liver glycogen by 36 per cent., while injection of the plasma of the same patients, taken 90 minutes after ingestion of 100 g. of glucose, produced a fall of 29 per cent. Similarly, the plasma taken during recovery from insulin hypoglycæmia, 30 minutes after injection into a vein of 5 units of insulin, was not appreciably more potent than the plasma of the same patient in the fasting state. The activity of plasma in reducing liver glycogen could not, therefore, be correlated with the metabolic state of the donor.

EFFECT OF SERUM ON HEPATIC GLYCOGENOLYSIS IN VITRO

In view of the effect of the injected serum on the liver glycogen of the living animal we proceeded to investigate the action of normal fasting human serum on hepatic glycogenolysis in vitro.



Effect of serum on hepatic glycogenolysis in vitro (rabbit's liver).

A brei was prepared from the liver of a rabbit, killed and bled out 3 hours after a meal of carrots, by grinding with sand in a phosphate buffer solution of *p*H 7·4 and straining through muslin. A mixture of 10 c.cm. of the brei and 10 c.cm. of serum was placed in a flask and incubated in a water-bath at 37° C. with constant shaking for 2½ hours. As a control 10 c.cm. of the liver brei plus 10 c.cm. of Tyrode solution were incubated under the same conditions. Sterile precautions were observed throughout. Samples of 1 c.cm. were removed at 30-minute intervals, and the glycogen estimated by the micromethod described by Evans and others (1931).

As is seen in the graph the rate of glycogenolysis was greatly enhanced in the presence of serum.

An analysis of the sugar present in the brei before and after incubation was made. Assuming that any increase in reducing power on hydrolysis after removal of glycogen is due to the presence of maltose, the rabbit liver brei, before incubation, would appear to contain no maltose (Table II). The brei incubated with serum appears, however, to develop a considerable content of this sugar. It seems reasonable, therefore, to assume that the accelerating power of human serum on glycogenolysis in the rabbit liver is due to its inherent diastatic activity.

We then examined the behaviour of rat liver brei, fortified with glycogen, by the same methods. To our surprise, the serum produced no acceleration in glycogenolysis. The brei itself before incubation, in contradistinction to the rabbit's, contained appreciable quantities of maltose, and the reducing substance present at the two hours' incubation was apparently almost entirely maltose, the reducing power after hydrolysis being approximately doubled; very little glucose was therefore present in the final product. No dextrins were formed. The mean results of three experiments of this type are shown in Table III.

TABLE II

Rabbit: Reducing Power of Brei and Brei + Serum before and after Hydrolysis

(Expressed as g. glucose per cent.)

—	Before and after incubation.	BREI.		BREI + SERUM.	
		Non-hydrolysed.	Hydrolysed.	Non-hydrolysed.	Hydrolysed.
1	Before.	0·173	0·169	0·201	0·176
	After.	0·376	0·413	0·507	0·582
2	Before.	0·045	0·036	0·066	0·063
	After.	0·320	0·351	0·470	0·713
3	Before.	0·067	0·048	0·079	0·059
	After.	0·173	0·396	0·226	0·560

TABLE III

Rat: Glycogen and Reducing Power of Brei and Brei + Serum before and after Hydrolysis

(Expressed as g. glucose per cent.)

Before and after incubation.	BREI.			BREI + SERUM.		
	Glycogen.	Sugar: non-hydrolysed.	Sugar: hydrolysed.	Glycogen.	Sugar: non-hydrolysed.	Sugar: hydrolysed.
Before ..	1·03	0·13	0·21	1·10	0·13	0·18
After ..	0·25	0·54	1·09	0·30	0·59	1·07

The glycogenolytic action of the rat liver brei is apparently much more vigorous than that of the rabbit, but the reaction appears to be carried only as far as maltose. In contradistinction to the rabbit, glycogenolysis in the rat's liver brei is not accelerated by addition of serum. In view of this finding it would seem unlikely that the reduction in liver glycogen in our serum-injected rats was due to the presence of the diastatic enzyme of the serum.

At the moment we are not in a position to discuss these results further. Our belief is that the reduction in liver glycogen which follows injection of human serum into the rat is not the result of the introduction of amylolytic ferments; it does not appear to be in any way a peculiar property of diabetic serum. We have not explored the possible connexion of the phenomenon with hormones which are known to affect the glycogen content of the liver, and which might be present in the injected serum.

CONCLUSIONS

1. Injection of fasting human serum into rats is followed by a reduction in their liver glycogen.

2. The percentage reduction is the same, whether normal or diabetic sera are used.

3. Human serum accelerates glycogenolysis in the rabbit's liver brei in vitro; in the rat no such effect is observed.

4. It seems unlikely that the effects of the injection of serum on the rat's liver glycogen are due to amylolytic ferments in the serum.

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LARYNGEAL DIPHTHERIA AND TRACHEOTOMY

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DURING the eleven-year period 1926–36 there were in the City of Glasgow Fever Hospital, Shieldhall, 2528 cases of diphtheria, of which 220, or 8·7 per cent., were laryngeal cases. This category includes all patients having sufficient croup to require treatment in the steam tent. Table I shows the ratio year by year of such cases to the total. It is tending to fall, being never under 10 per cent. before 1930, and only 3·5 per cent. in 1933.

Goodall (1928a) finds faucial to be associated with laryngeal diphtheria in about 18 per cent. of hospital cases. Of 5897 diphtheria cases admitted to the Edinburgh City Hospital during the years 1922–29, 9·8 per cent. were laryngeal (Benson 1931).

TABLE I

Diphtheria, 1926–36: Incidence of cases (all types), laryngeal cases, and tracheotomies, with death-rates

Year.	Cases*	Laryngeal cases and per cent.	Tracheotomies.	Death-rate per cent.	
				All cases.	Laryngeal cases.
1926	200	23 (11·5)	6	4·5	0
1927	282	31 (11·0)	6	6·0	9·7
1928	250	25 (10·0)	8	4·0	4·0
1929	253	26 (10·3)	8	7·9	15·4
1930	297	29 (9·8)	7	5·4	3·4
1931	225	11 (4·9)	0	2·2	0
1932	206	16 (7·8)	5	5·3	18·7
1933	173	6 (3·5)	3	4·6	0
1934	141	10 (7·1)	4	2·8	10·0
1935	261	23 (8·8)	5	5·4	4·3
1936	240	20 (8·3)	3	4·2	5·0
	2528	220 (8·7)	55	4·9	6·8

* Figures based on dismissals and deaths.

There is, of course, no relationship between the degree of croup and the extent of false-membrane formation in the throat and nose. In 145 patients, or 65·9 per cent. of the laryngeal cases, croup was the only clinical manifestation of diphtheria, while in 75, or 34·1 per cent., it accompanied a faucial or nasopharyngeal infection.

Other observers record a lower proportion without faucial involvement. Thus Gover (1918) found that 47·3 per cent. of 112 cases, and Tolle (1930) only 23·1 per cent. of 212 cases, had membrane limited to the larynx.

Of the laryngeal diphtheria infections, croup was severe enough in 25 per cent. to require surgical treatment. The main purpose of this paper is to analyse this group, representing 55 consecutive tracheotomy operations performed by me (with three exceptions) in Shieldhall Hospital.

INCIDENCE OF CASES REQUIRING OPERATION

The *annual incidence* appears in Table I. The reduced prevalence of croup in the later years of the investigation is reflected in a lower tracheotomy rate, which averaged 7 per annum in the period 1926–30, but only 3·3 thereafter. This decline may be taken as an indication of earlier diagnosis, leading to more prompt hospitalisation and effective treatment.

The *seasonal incidence* shows, naturally, a preponderance of cases in the winter months—viz.:

Month ..	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Cases ..	9	5	8	4	7	1	1	1	7	2	4	6

Age and sex.—The sexes are almost equally represented (Table II). The youngest children were aged 4½, 8, 9, and 10 months, and the oldest 7 and 9 years. Approximately equal numbers were under 2, between 2 and 4, and over 4 years. The deaths column of the Table shows that age is not a factor in determining prognosis.

TABLE II

Tracheotomy: Age- and sex-distribution

Age.	Males.	Females.	Total.	Deaths.
– 1 ..	3	1	4	—
1– 2 ..	7	7	14	6
2– 3 ..	3	4	7	—
3– 4 ..	3	9	12	3
4– 5 ..	4	2	6	2
5– 6 ..	1	4	5	1
6– 7 ..	4	1	5	1
7– 8 ..	—	1	1	—
9–10 ..	1	—	1	1
—	26	29	55	14

Clinical types.—Table III shows the frequency and effect on mortality of faucial and nasal lesions in association with croup. The classification is based on the recent report (1936) on the nomenclature of diphtheritic infections, tonsillar diphtheria indicating that membrane is limited to the tonsils, and nasopharyngeal that it has spread to the soft palate, pharynx, or nasal cavity. This form, combining profound toxæmia with the obstructive danger, has, in operated cases, a mortality double that of croup without faucial or nasal complication. It is also noteworthy that operation was required in only 24 of 145 simple laryngeal cases, and in no less than 31 of 75 complicated cases.

TABLE III

Tracheotomy: Clinical types of cases

	Cases.	Deaths.	Operation death-rate per cent.
Simple laryngeal (croup) ..	24 ..	4 ..	16·6
Croup + tonsillar diphtheria ..	24 ..	7 ..	29·2
Croup + nasopharyngeal diphtheria	7 ..	3 ..	42·9

Duration of illness.—The time elapsing between onset and admission to hospital, as obtained from the parents, may be tabulated:

Duration.	Cases.	Deaths.
1– 3 days	25	6
4– 7 „	21	7
8–12 „	9	1

No correlation between duration and degree of illness was established.

Condition on arrival.—Almost half of the patients arrived gravely ill, 5 being moribund; 13 were notably well nourished, and only 4 ill nourished, fat children appearing more prone than others to laryngeal obstruction. Croup was not always severe, but became so within 24 hours. Recession of the costal interspaces and epigastrium, one of its chief manifestations, tended to diminish as respiration failed, while a rising pulse-rate indicated cardiac distress. Pallor was more common than cyanosis. Restlessness, a feature of the moderate case, gave place, as asphyxia become imminent, to profound prostration. Bronchitis, enteritis, and albuminuria were occasionally present. Only six initial temperature readings were over 101 degrees, while twenty were below 99·4.

INDICATIONS FOR OPERATION

The routine treatment for the case of croup not in need of immediate operation, consists of the steam-tent, light poultices to the neck and chest, and stimulants when necessary. No restraint is imposed on the child, who is better sitting up in comparative comfort than lying down suffocating. Serum, given intramuscularly, is used with moderation, since a large dose may aggravate obstruction by causing too rapid separation of membrane. Save in the naso-pharyngeal type, 8000 to 12,000 units is usually sufficient.

Most patients—75 per cent. in my experience—respond rapidly to this treatment, croup disappearing within two or three days. In the remainder respiratory obstruction increases so as to endanger life. In every such case a point is reached when it is apparent to the experienced observer that spontaneous recovery will not take place. Then is the time to operate. Every hour of further delay leaves the child weaker and less able to survive operation. Too often the practice appears to be that of Ker (1929b) who says there is often no need to operate till "the face becomes pale, the respirations more shallow, the recession less, and the pulse weaker and more rapid." For his maxim, "in hospital, interfere late," I would substitute, "in hospital, interfere as early as possible in the advancing case."

TABLE IV

Tracheotomy: Time of operation

		Cases.	Deaths.
Immediate		9	4
1– 3	Hours after admission	15	3
3– 6		12	4
6–12		9	1
12–18		4	2
18–32		6	—
		55	14

Many patients reach the critical stage before coming to hospital. Table IV indicates that nearly half in this series required operation within three hours of arrival.

Operation.—A description of tracheotomy is unnecessary, save that after the skin incision blunt dissection is relied on, thus avoiding troublesome hæmorrhage. As to anæsthesia, children under 3 rarely require it, being already sufficiently anæsthetised by lack of oxygen. Older children, who may be acutely conscious, nervous, and difficult to control, may be given a little chloroform, followed if necessary by ether. Deep anæsthesia is altogether objectionable, not only for its depressing effect, but because it abolishes the cough reflex so essential for clearing the trachea before insertion of the cannula. The amount of membrane expelled varies with the degree of invasion of the trachea and bronchi, but in some of the gravest tracheobronchial infections there may be none.

RESULTS OF OPERATION

Of the 55 patients, 41 made a good recovery. Immediate and striking improvement nearly always follows operation. Children remain in the steam-tent for two or three days, quickly becoming accustomed to the tracheal cannula. Feeding presents no difficulty, the nasal tube being rarely required. Every effort should be made to withdraw the cannula during the first week, otherwise it is likely to be retained for several. Thus 33 children, or 80·5 per cent. of recoveries, dispensed with it within a few days (Table V), while

TABLE V

Tracheotomy: Recoveries, time of removal of tube

Age in years—	–1	–2	–4	–8	Total.
3rd day ..	— ..	6 ..	5 ..	8 ..	19
4th „ ..	1 ..	— ..	7 ..	4 ..	12
5–6 days ..	— ..	— ..	1 ..	1 ..	2
3–4 weeks ..	— ..	2 ..	2 ..	— ..	4
6–8 „ ..	3 ..	— ..	1 ..	— ..	4

the remainder retained it for periods of 3 to 8 weeks. The prolonged need for the tube, which was observed only in children under four years, takes one of two forms: (1) Immediate laryngeal spasm, induced by fear. Crying, cyanosis, and intense dyspnœa at once follow withdrawal, and end with reinsertion. It may be obviated sometimes by leaving a tape tied round the neck, leading the child to think he is still wearing the tube. (2) Asphyxia of more gradual onset, probably spasmodic also. Symptoms are delayed for a few days, to appear as the tracheal wound closes. For this condition I have used a skeleton tube with open back. Its orifice is blocked for some time prior to removal, thus teaching the child to breathe through his larynx. Much patience may be required before normal breathing is re-established.

An example of such a case is provided by the youngest patient in the series, a well-nourished female infant of 4½ months, with clean throat, suffering from croup of 24 hours duration, sufficient latterly to threaten asphyxia. Only the inner tube of the cannula would enter the trachea, and later a very small cannula was specially made. Eight weeks elapsed before it was dispensed with, but convalescence was otherwise uneventful. I can find no other record of successful tracheotomy in an infant less than six months old.

Complications.—8 children, whose ages are shown, had complications as follows:

Paralysis of palate; 6 years; a naso-pharyngeal case.
Strabismus; 2 years; a tonsillar case.
Discharging nose and ears; 9 months.
Cervical adenitis; 3 years.
Jaundice; 3 years; of a few days' duration.
Bronchopneumonia; 6 years; severe; wound remained open and septic after removal of tube.
Whooping-cough; 1½ years; incubating on admission.
Septic arthritis; 1 year; a very puny child; knee-joint opened and drained of pus.

Residence in hospital varied from 24 to 87 days, with an average of 48·4 days. All were discharged with neck healed and in good general condition.

After-effects of Tracheotomy.—Clarke (1936) has recently drawn a gloomy picture of the late effects of tracheotomy: "Results such as pulmonary sequelæ, retained tube, granulations, and ugly scars render it an operation to be avoided if at all possible." That there is an association between it and subsequent tuberculosis has been asserted by Landouzy (quoted by Rolleston), but Rolleston (1929) was unable to verify any such association, having seen a number of adults who had undergone the operation in childhood, all free from tuberculosis.

Late Results.—An attempt to assess late results in the present investigation was made by inviting recently, through the parents, all former patients to return for examination.

Of 41 children, 17 were untraced through change of address. One was reported as living out of Glasgow, in good health. Two had died: (1) seven months after leaving hospital, while under anæsthesia for removal of tonsils; had been quite well in the interval. (2) Seven years after tracheotomy, of pulmonary tuberculosis, which had its onset two or three years after operation. All but two of the remainder were brought to see me.

The 19 members of this group varied in age from 3 to 16 years, with a maximum interval since operation of 11 years. With few exceptions their parents described them as having enjoyed perfect health. Two had suffered from bronchitis, one for four successive winters, after which it had not recurred; the other almost every winter since tracheotomy eight years before, with pneumonia superadded on three occasions. One other instance of pneumonia and two each of measles and whooping-cough were recorded.

Huskiness, the only throat symptom, affected three children: the first, very slightly; the second, for three years, disappearing when school age was reached. The third was a girl of 16, husky since tracheotomy at the age of 7, but much improved by a throat operation four years ago. The condition suggested papilloma of the larynx.

All had a healthy appearance, save two who were anæmic and one with signs of chronic bronchitis. The cervical scar was very slight in 14, less favourable in 5, four of whom had retained the tube unduly. No parent referred to it as ugly, the usual description being that it was "hardly noticed."

In brief, only two patients suffered from severe respiratory disease, in one case tuberculosis, and there is no evidence to associate it directly with the tracheotomy operation.

FATAL CASES

There were 14 cases, eight being males and six females, death supervening from one hour to 22 days after operation. Table VI shows the relationship

TABLE VI

Tracheotomy: Fatal cases, time of death after operation

Age in years—	−2	−4	−7	−10	Total.
Under 12 hours ..	— ..	— ..	— ..	1 ..	1
12–24 „ ..	1 ..	— ..	1 ..	— ..	2
1– 2 days ..	1 ..	1 ..	1 ..	— ..	3
2– 7 „ ..	2 ..	— ..	1 ..	— ..	3
7–14 „ ..	1 ..	2 ..	1 ..	— ..	4
22 „ ..	1 ..	— ..	— ..	— ..	1

of age to time of death. Only one child failed to survive for 12 hours, many of the others showing, for a time, much improvement. The association of clinical type with mortality has been referred to above. Death following tracheotomy results from one of three conditions:

Tracheobronchial diphtheria.—Operation gives temporary benefit by relieving the laryngeal obstruction, but as the lower air passages cannot be cleared of membrane, asphyxia is inevitable. There were four such cases, aged $1^{4}/_{12}$, 3, 4, and 4 years, all gravely ill from the beginning. In two the fauces were clean, in two extensively coated. Tracheotomy was within three hours of arrival, indicating urgent croup; practically no membrane coughed up. Recurrent choking fits ended in death 24 hours, 2, 4, and 5 days later.

Bronchopneumonia.—The four children, aged $1^{1}/_{12}$, $1^{3}/_{12}$, $1^{9}/_{12}$, and 5 years, who died of this complication had faucial lesions of moderate degree, and required early operation. Complete relief of croup was followed, however, by delay in healing of the tracheal wound, a factor clearly associated with infection of the lungs. Thus one child retained the cannula till death; two others dispensed with it on the third day, but continued to breathe entirely through the opening; in the fourth it was withdrawn on the 16th day, leaving a very septic, gaping wound. Rapid deterioration attended the onset of pneumonia, which led in one case to streptococcal empyema, in another to gangrene of the lungs. Deaths occurred on the 7th, 9th, 12th, and 22nd days. Bronchopneumonia following tracheotomy, while very grave, is not inevitably fatal. A recovery has been mentioned, giving a mortality-rate in this series of 80 per cent.

Toxæmia.—The six patients in this group, aged $1^{8}/_{12}$, $1^{10}/_{12}$, 3, 3, 6, and 9 years, exhibited toxæmia in varying degree. Four reached hospital moribund or gravely ill. Extensive false-membrane formation on the fauces was the rule. Operation times—viz., 1, 4, 5, 10, 14, and 18 hours after admission, indicate that obstruction was not always dangerous at first, but progressive. Three patients required anæsthesia; two collapsed on the table, but revived, one of them—aged 9, a grave laryngo-nasopharyngeal infection—dying an hour later. This case apart, death was always sudden, and followed a period of improvement entirely free from either obstructive or pneumonic symptoms. In three cases collapse was within 16 and 36 hours of operation, in two postponed till the 9th and 10th day respectively, by which time the tracheal wound was healing. Pharyngeal paralysis preceded death by 48 hours in one instance.

Sudden cardiovascular failure, common in severe non-obstructive diphtheria, results from toxæmia, in the production of which diphtheria of the larynx plays a very small part. In the present examples, anæsthetic and surgical shock may be pointed to as contributory causes, but would not account for collapse after a week's interval. I am convinced that death of at least three patients was entirely of toxic origin, and in no way related to the laryngeal lesion.

MORTALITY OF LARYNGEAL DIPHTHERIA

Laryngeal diphtheria is generally regarded as a very serious condition, with much higher mortality than other forms of the disease. Ker (1929a) gives the death-rate in Edinburgh City Hospital as never less than 11 per cent., with an average of 20 to 25 per cent. More recently Benson (1931) has a rate in Edinburgh varying from 29·2 in 1923 to 12·8 per cent. in 1930. Litchfield and Hardman (1923), in 106 cases in New York, had a 13 per cent. mortality. Each of these observers relies on intubation.

In the present series, Table I shows comparative figures for diphtheria (all types) and for laryngeal diphtheria. In the former category deaths were highest in 1929 (7·9 per cent.) and lowest in 1931 (2·2), with a rate for the whole period under review of 4·9 per cent. The rate for laryngeal cases fluctuates much more widely, from over 18 per cent. to zero; for the whole period it is 6·8 per cent. The difference of only 1·9 suggests that the gravity of laryngeal as compared with other forms of diphtheria has sometimes been exaggerated. Hogan's (1921) statement, in particular, I find difficult to accept—namely, that 82·1 per cent. of diphtheria deaths in Baltimore have been due to laryngeal infections. In this series, of 124 deaths from diphtheria (all forms), only 15, or 12·1 per cent., were from laryngeal diphtheria.

Objection may be raised that the reason for the low mortality is that not all the cases quoted were diphtheritic. Admittedly no routine culture or inspection of the larynx was carried out, but it is affirmed that the clinical picture of croup was identical whether or not the presence of false-membrane on the fauces made the diagnosis certain. Occasional cases of retropharyngeal abscess, laryngismus stridulus, and foreign body received as laryngeal diphtheria are of course excluded. Membranous croup has been ascribed to the streptococcus, but the deep injection of the fauces that would suggest such infection was hardly ever seen; and simple catarrhal laryngitis is rarely severe enough to simulate diphtheria of the larynx. Very few cases are likely, therefore, to have been non-diphtheritic, and the effect of their inclusion on the mortality-rate is negligible. Elimination of one-third of the cases without visible membrane would raise it only to 8·7 per cent.

Unoperated cases.—It must be emphasised that in a series of hospital-treated patients, deaths are limited almost entirely to those undergoing operation Facilities are always at hand for the relief of obstruction, at least temporarily. Theoretically no patient should die in hospital unoperated; in practice admission may be too late for treatment, surgical or otherwise, to be of any avail. Such cases are few; I can record only one.

Operation fatality-rate.—The 14 deaths following tracheotomy represent a mortality of 25·5 per cent., or, if the three regarded as purely toxæmic be excluded, 20·0 per cent.

Intubation.—Published statistics relating to croup refer almost entirely to intubation. This alternative procedure avoids an external wound, but requires more constant supervision, and has often to be followed by tracheotomy. Thus Goodall (1928b) reports that 159 of 454 intubations in the Eastern Hospital, London, were followed by tracheotomy, with a combined mortality of 22·5 per cent. Primary tracheotomy, reserved apparently for the severest cases, had a mortality of 40·9 per cent., the rate for all cases taken together being 26·6 per cent. Ker (1929c) quotes operation fatalities in Edinburgh at about 28 per cent. over a ten-year period prior to 1912, rising later to reach, at one time, over 40 per cent. Schamberg and Kolmer (1928) give the mortality in the Philadelphia Hospital for the years 1903–13 as 35·6 per cent. Litchfield and Hardman (1923) in a series of 18 patients, had a 44·4 per cent. mortality.

Aspiration.—The practice of direct inspection of the larynx, combined with aspiration of membrane by means of a suction apparatus, was introduced by Joe (1929) to this country from the Willard Parker Hospital, New York. Considerable value is ascribed to it there, in that the number of cases requiring operation is greatly decreased. A fall in death-rate of intubated cases from 54 per cent. in 1922 to 16·6 in 1927 is attributed partly to suction and partly to milder diphtheria; but in 1928 it rose to 28·5 and in 1929 to 37·5 per cent. Litchfield and Hardman (1923) recommend aspiration especially for cases with low membrane, which cannot be reached by intubation or tracheotomy. Benson (1931) records favourable results, but mentions certain limitations to its use, and indicates the danger of collapse from repeated suction.

It may be said that the aspiration method is still on trial. Conclusive evidence in its favour will be furnished only by a substantial drop in the case mortality-rate, and this has yet to be recorded. Hitherto it has been advocated only by protagonists of intubation, but it might be associated equally well with tracheotomy.

Meanwhile, in the absence of facilities for aspiration, I have presented the case for tracheotomy alone, and submit that it gives better results than intubation in the treatment of laryngeal diphtheria.

SUMMARY

1. Of 220 cases of laryngeal diphtheria, tracheotomy was performed in 55, with case mortality-rate of 6·8, and operation death-rate of 25·5 per cent.

2. Early operation is advocated, as affording the best chance of success.

3. Serious after-effects are rare; a case of pulmonary tuberculosis is recorded.

4. Pneumonia, toxæmia, and unrelieved obstruction contribute alike to the mortality.

5. The results compare favourably with the published results of intubation, indicating tracheotomy as the better operation for the relief of croup.

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INHIBITION OF MENSTRUATION AND OVULATION BY MEANS OF TESTOSTERONE PROPIONATE

BY S. ZUCKERMAN, D.Sc. Lond., M.R.C.S. Eng.

(*From the Department of Human Anatomy, Oxford*)

In 1922 Evans and Long [1] reported that the administration of fresh anterior hypophyseal tissue to normal cyclic female rats leads to the suppression of œstrus, a finding which they correlated with the presence of abundant lutein tissue in the ovaries of the treated animals. These experiments have been confirmed and extended by a number of workers,[2] and it is generally accepted to-day that the inhibition of the cycle is due to the luteinisation that is stimulated by the gonadotropic hormone of the anterior lobe. Inhibition of œstrus also results from the administration of progestin, a fact which Papanicolaou [3] demonstrated in 1926, and which later workers have substantiated, using crystalline progesterone.[4] Œstrogenic substances have a similar action,[5] and so too have crude testicular extracts [6] and crystalline male hormones.[7] It thus appears that, when given in adequate amounts, any of the sex hormones will stop the œstrous cycle.

The gonadal hormones appear to be similarly effective in the case of the menstrual cycle, which for all purposes may be regarded as a specialised type of œstrous cycle. Thus œstrin inhibits menstrual bleeding both in monkeys [8] and women.[9] Progestin [10] has the same action, and Menninger-Lerchenthal [11] has recently reported that the administration of over

300 capon units of a non-crystalline male hormone preparation delayed menstruation in a 40-year-old woman for 6 to 8 days. The observations recorded below show that adequate quantities of the male hormone "testosterone propionate" will suppress menstruation for apparently indefinite periods in normal mature rhesus monkeys (*Macaca mulatta*).

FIG. 2.—Slightly involuted endometrium of OM. 28 after 210 days of treatment with testosterone propionate. (× 15.)

SUPPRESSION OF MENSTRUAL BLEEDING

The subject of the first experiment was a mature monkey (OM. 28) weighing 5·2 kg. The seven menstrual cycles which preceded the injections were 30, 26, 23, 25, 26, 23, and 25 days long respectively. Testosterone propionate (25 mg.) was given twice weekly, beginning on the second day of the eighth cycle, and the treatment was continued for 210 days, when the animal was autopsied. Uterine bleeding did not occur during this period, and the vaginal washings became clear about a fortnight after the start of the experiment. Occasionally they contained mucus. In all the animal was given 1·5 g. of the hormone.

At autopsy the ovaries were very small, and contained neither corpora lutea nor any follicles more than about 2 mm. in diameter (Fig. 1). Before its death the monkey had been injected with colchicine, a procedure which assists in the determination of cellular proliferation, since the drug arrests and "fixes" dividing cells. Examination of serial sections showed that primordial follicles were as numerous as they are normally, and that there were many mitotic figures in the granulosa and thecal cells. Follicles apparently ceased to grow, however, after reaching the resting stage of development, when they underwent atresia. Many of the smaller follicles are also undergoing atresia, but the ova in most of the small and primordial follicles are apparently healthy. There is no recognisable luteal tissue in either ovary. Both contain patches of very lightly-staining large cells whose cytoplasm appears to consist mostly of clear droplets. These cells occur in somewhat œdematous areas of the ovarian stroma, and it is possible that they represent some peculiar transformation of old luteal tissue. This last characteristic is somewhat abnormal, but otherwise the ovaries are no different from the inactive ovaries met with in lactation.

The uterus is small and the endometrium is shallow (Fig. 2). The glands are of the interval tubular type, although some are distended. They are not secreting, and their basement membranes are somewhat diffuse. The glandular and surface epithelium is fairly low, and the cells, a few of which are in process of division, contain relatively large vesicular nuclei. The stroma is not very vascular, and is densely packed, especially in the superficial zone. There are no signs of degeneration anywhere in the uterus, which is not as much involuted as is, for example, the uterus of lactation.

The cervix is secreting profusely, and its epithelial elements vary in height. The vaginal epithelium is not cornified. In most regions it is no more than four to six cells deep. The uterine tubes and mammary glands are also inactive.

A similar series of injections was given to a second normal mature rhesus monkey (OM. 77), which at the start of the experiment weighed 5·3 kg. Treatment was begun on the second day of a cycle. The preceding seven cycles were 43, 45, 25, 22, 28, 22, and 25 days long respectively. Treatment was stopped after 114 days, and when a total of 0·85 g. of testosterone propionate had been administered. Eight days later uterine bleeding set in—for the first time since the start of injections. It demarcated a period of 122 days' amenorrhœa. The animal was given colchicine, and autopsied on the second day of bleeding.

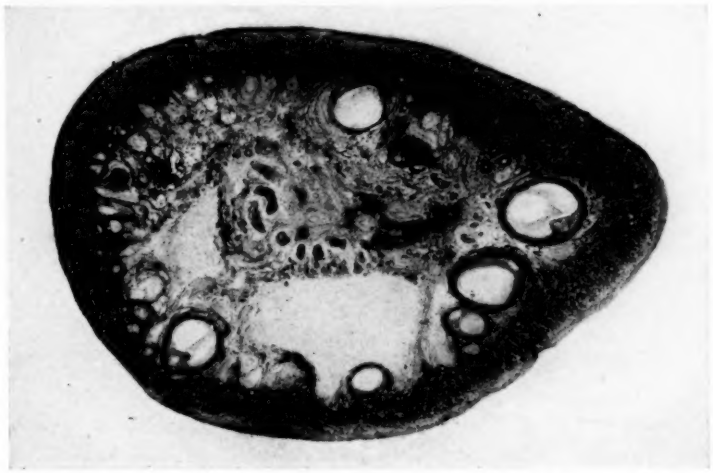

FIG. 1.—Ovary of OM. 77. There are no large follicles and there is no evidence of recent ovulation. (× 10.)

The ovaries are in the same condition as those of OM. 28 (Fig. 1) except that there are many more mitotic figures in the follicles (Fig. 3). The uterine mucosa is of the interval type, and menstruation is in progress (Fig. 4). The endometrium is better developed than that of OM. 28, and there are many mitotic figures in both the glandular epithelium (which is more columnar than in OM. 28) and the stroma (Fig. 5). The cervical glandular cells are very

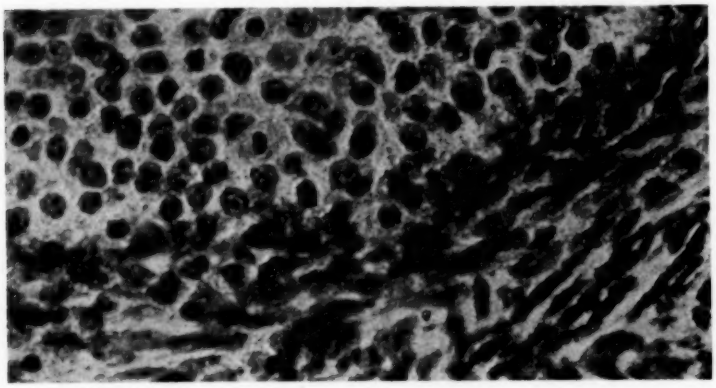

FIG. 3.—Mitotic figures in the granulosa and theca of a follicle of OM. 77. (× 600.)

tall and are also secreting profusely (Fig. 6). The vagina is like that of OM. 28 (Fig. 7).

The extensive signs of cellular proliferation in the ovaries of this animal, as compared with OM. 28, indicate clearly that in the week following the last injection of testosterone propionate they had responded readily to endogenous follicle-stimulating hormone. The endometrium, too, shows clear signs of œstrogenic stimulation, and it is thus plain that the inhibitory effects of the male hormone are transient, and that, in the dosage in which it was given, its effects do not last longer than a week. The healthy appearance of the reproductive organs and their responsiveness to the altered conditions following the end of the experimental treatment show too that they were in no way injured by the injections.

The occurrence of bleeding so soon after the cessation of injections is difficult to explain, unless it be assumed that the amount of male hormone given was no higher than the threshold dose for suppressing the cycle, and that a certain amount of endometrial growth had occurred during the last phase of the treatment. A possible analogy for this bleeding is the menstruation that marks the end of lactation anœstrus in monkeys, and which sometimes precedes any external signs of œstrogenic stimulation.[13]

The ovaries of monkeys and rats appear to react differently to sex hormones. As noted above, the inhibition of œstrus in rodents by means of gonadotropic extracts of the anterior pituitary is generally attributed to the stimulation and persistence of luteal tissue. When the cycle is suppressed by means of œstrin, the mechanism of inhibition varies according to the amount of hormone given. Moderate doses lead to persistent vaginal cornification, and to "atrophy" of the ovaries, the ovarian change, according to Moore and Price [13] being an effect of the depressing action of œstrin on the gonadotropic functions of the pituitary. Large doses cause luteinisation,[14] and the corpora lutea thus stimulated may over-ride the injected œstrin in the production of changes in the accessory reproductive organs. One interpretation of the effect of large doses is that œstrin depresses the follicle-stimulating powers of the anterior pituitary (possibly by stimulating the production of an "antagonist" [15]), and that it enhances the pituitary's luteinising action. Luteinisation of the rat ovary may also be caused by both progesterone and testosterone propionate.[16] Thus ovarian activity—i.e., luteinisation—is concerned in the inhibition of œstrus in the rat in each of the hormonal methods by which its suppression can be achieved.

Such does not appear to be the case in the inhibition of menstruation. Ovulation is suppressed during the time normal mature monkeys are injected with œstrin,[8] while ovarian action is undoubtedly inhibited by male hormone in the amounts in which it was given in the present experiments. Testosterone propionate thus appears to provide a means for securing and controlling temporary sterility.

PROGESTATIONAL CHANGES

Klein and Parkes [17] have found that methylated and ethylated testosterone and dihydrotestosterone have a progestational action on the rabbit uterus of about 1/20 the potency of progesterone. Testosterone has a similar, but much less pronounced, action. The progestational properties of testosterone propionate were therefore tested on an immature normal rhesus macaque (OM. 192), and two mature spayed monkeys (OM. 107 and OM. 183) of the same species. Each animal was first injected daily for 14 days with increasing amounts of œstrone to sensitise the uterus. Testosterone propionate was then administered for 14 days, the most given in any experiment being 10 mg. daily. None of the animals

FIG. 4.—Endometrium of OM. 77 on the second day of menstruation which began seven days after the end of 114 days' treatment with testosterone propionate. The endometrium shows many signs of proliferation, and is much deeper than that of OM. 28. (× 15.)

shows any progestational changes, and in each the endometrium is in a healthy interval condition

GENERAL AND EXTERNAL EFFECTS OF TESTOSTERONE PROPIONATE ON FEMALE MONKEYS

All the monkeys referred to above continued in excellent health during their treatment with male hormone, and in so far as it was possible to judge, the general vitality of at least two was enhanced. Sections were prepared of almost every organ in the body of three animals that were given the hormone for four months or longer (OM. 28, OM. 77, OM. 193). No tissue appeared abnormal.

Male hormone has a so-called "masculinising" effect on the external genitalia of monkeys, an effect which essentially comprises enlargement of the clitoris. This change, which has also been noted by Hamilton,[18] becomes obvious about a fortnight after treatment begins. Growth occurs both in the corpora cavernosa and in the preputial skin, and the clitoris in one animal was 2 cm. long when pulled out. In normal animals the exposed part of the clitoris is rarely longer than 1 cm. The glans and frenulum become well-differentiated.

The amount of growth in the clitoris was no greater in an animal which was given twice the amount of testosterone propionate that OM. 28 and OM. 77 received. This monkey (OM. 193), a prepubertal specimen, was given 100 mg. of the hormone a week for five months, and at the end of the experiment the clitoris was no more than 1 cm. long. The other external genital organs were normal.

It has been shown that male hormone stimulates the periurethral glands of female rats, the glands when active resembling the prostatic glands of the male.[18 20] In view of this observation, serial sections of the entire urethra of OM. 28, OM. 77, and O.M. 193 were prepared. They failed to reveal any peri-urethral glands. A lobule of gland similar to prostatic tissue was, however, found dorsal to the vagina of OM. 193. In view of its position, and of the absence of a similar structure either in other

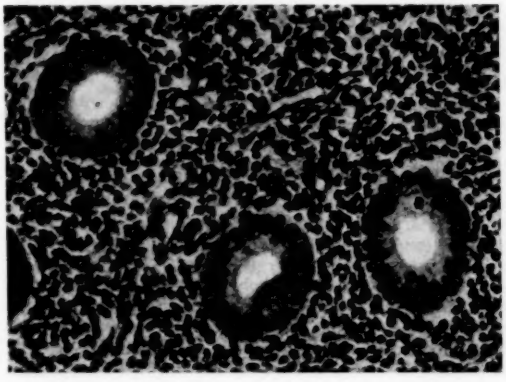

FIG. 5.—Uterine glands of OM. 77, showing mitotic figures. (× 305.)

experimental animals or in control specimens, its presence is regarded as an anatomical anomaly.

Sections of the broad ligament failed to show any development of Gärtner's duct.

A further external effect of testosterone propionate in the female rhesus monkey is reddening of the sexual skin. The change, which in the youngest animal (OM. 193) was accompanied by some œdema of the pubic lobes of skin, develops gradually, and is in all respects similar to the development of colour in normal males of the species.[21] These external changes would not be expected to occur in species, like Man, in which there is no sexual skin. Moreover, histological section showed that no appreciable

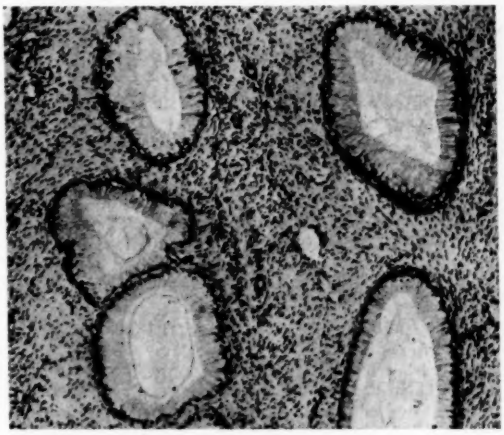

FIG. 6.—Actively secreting glands of cervix uteri of OM. 77. (× 85.)

thickening of the epidermis, such as takes place under the influence of œstrogenic stimulation, occurs.

The nipples do not appear to increase in size.

During growth the clitoris of the normal rhesus monkey moves backwards, from a position in front of the callosities, until in mature animals it generally lies on, or just behind, a line connecting the anterior margins of the callosities.[19] A further growth change in the conformation of the hinder region of the rhesus is rotation of the callosities. In older animals the angle formed by the intersection of the long axes of the callosities is much more obtuse than in younger animals.[19] Observation of the two older and of the one young monkey that were injected for prolonged periods showed no effect of the male hormone on either of these two characters.

CONCLUSION

Monkeys are unsuitable subjects either for the investigation of hair growth or for the study of alterations in voice. No changes in these characters have, however, been reported as a result of the clinical use of testosterone propionate for the alleviation of certain disorders that follow ovariectomy in women.[22] Moreover, the degree of proliferation in the hair follicles of the monkeys treated with male hormone, as determined by histological section, was much less than that seen in monkeys that have been injected with œstrin. Thus since the masculinising effects of testosterone propionate appear to be both slight and controllable, it would seem that the hormone provides a method, well worth clinical investigation, of securing temporary sterility and of controlling uterine bleeding.

SUMMARY

The administration of 25 mg. of testosterone propionate twice weekly to normal mature female rhesus monkeys stopped the menstrual cycle during the period of injections (up to seven months). The internal reproductive organs are not injured by the treatment, and in one animal menstruation restarted about a week after the last injection. Follicular growth and luteinisation are both inhibited. Apart

from enlargement of the clitoris, no other changes of clinical significance occurred.

It is suggested that testosterone propionate may be of clinical value for the induction of temporary sterility and the control of uterine bleeding.

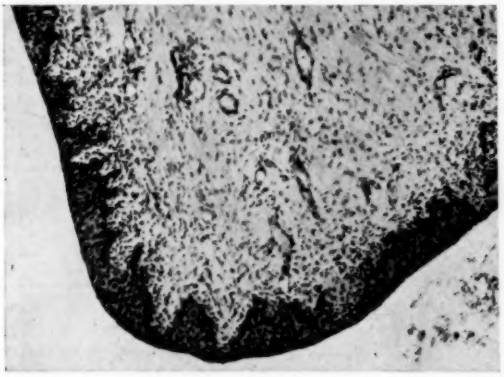

FIG. 7.—Vaginal epithelium of OM. 77. The shallow epithelium shows many signs of proliferation. (× 85.)

My best thanks are due to Dr. K. Miescher, of Messrs. Ciba Ltd., for his kindness in supplying the testosterone propionate used in this study. The monkeys were bought with the aid of grants from the Eugenics Society and the Medical Research Council.

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WEST KENT GENERAL HOSPITAL, MAIDSTONE.—Lady Baldwin will open the new maternity unit at this hospital on Oct. 26th. The unit is being established by the corporation and hospital authorities on a basis of equal costs.

ABSORPTION AND EXCRETION OF IRON

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THE human body contains a number of inorganic constituents, and it is generally considered that the amount of each remains more or less constant from year to year. This constancy is brought about by the fact that intake and output balance. Now, while the intestine is the chief site of absorption, there are two main paths of excretion—via the kidneys in the urine, or via the intestine in the fæces. If any substance that has been taken by mouth is excreted in the urine it must have been absorbed into the blood stream. If it is excreted in the fæces it may have been absorbed and re-excreted, or it may never have been absorbed at all. Some inorganic elements—e.g., sodium and potassium—are excreted mainly by the kidneys. Others—e.g., iron—are excreted mainly in the fæces. A third group—e.g., calcium—fall into an intermediate category.

Sodium is an element eaten daily in large amounts. The fæces as a rule contain only very small quantities, about enough to make them isotonic with the blood, so that practically all the sodium that is eaten must be absorbed either in the small or large intestine.[111] The distribution of sodium in the body is limited mainly to the extracellular fluids. In health the volume of these fluids and the level of sodium in them vary very little from day to day, so that the body has practically no storage capacity for sodium. Its excretion, however, is so efficiently regulated that the body can easily maintain itself in health and in sodium balance on intakes varying from 0·4 to about 10 grammes a day. During McCance's [57] experiments on sodium chloride deficiency the daily excretion of sodium in the urine varied from 0·01–4·5 g., whereas the output in the fæces underwent no significant variations and was generally about 0·1 g. a day.

Hence, the amount of sodium in the body is controlled within narrow limits by a process of unlimited absorption, an absence of storage capacity, and a very finely regulated excretion.

IRON METABOLISM: EXPERIMENTAL FINDINGS

No theory of iron metabolism can possible explain all the experimental observations because many of them are mutually contradictory. There are, however, certain generalisations which any satisfactory theory must be expected to cover, and which will now be discussed. Within these generalisations there may be contradictory observations on points of detail which will be neglected if they are immaterial to the main issue.

1. *The fæces contain amounts of iron that vary directly with the amounts in the food, and are generally approximately equal to them.*[23 51]—The whole problem of iron absorption and excretion arises from this fact, because it is impossible to tell from balance experiments or from microscopical studies how much of the ingested iron has passed through the intestine unabsorbed, and how much has been absorbed, only to be re-excreted.

2. *The urine contains very little iron, and the amount is generally considered to bear little or no relation to the*

amount in the food.—This has been recognised for many years.[32 34] According to some observers [47 50 52] the urine of healthy men contains no iron at all. This, however, has not been the experience of most analysts.[18 27 36 62 69] McCance and Widdowson [58] found an increased excretion of iron in the urine during and after treatment of a polycythæmic patient with phenylhydrazine. It has been shown also that after iron salts have been injected intravenously, a small percentage of this iron rapidly appears in the urine, but that excretion only continues for about 20 minutes.[36 40 47] It is probable therefore that the kidney would readily excrete inorganic ionised iron and in variable amounts if it ever had the opportunity of doing so; that it does not do so under ordinary conditions suggests that the concentration of free iron in the plasma is always maintained at a very low level by the storage organs. In other words, the moment the concentration of free iron in the plasma rises the excess is competed for by the storage organs and the excretory organs. The former always win. It is also generally recognised that free hæmoglobin circulating in the plasma above a certain concentration is readily excreted by the kidney.[7 13 20 38]

3. *The body has considerable storage capacity for iron.*[15 16 54 63 64 67 68 78 79 80 81 110]

It will be observed that as so far discussed the metabolism of iron differs sharply from that of sodium.

4. *It is certain that in some way iron must be transported very efficiently about the body.*—During pregnancy, for instance, about 350 mg. of iron are transferred to the fœtus from the mother. Again, the healthy infant is born with an excess of hæmoglobin in its blood. This excess it converts largely to inorganic iron,[98] and it is unlikely that the conversion or the subsequent resynthesis takes place only at the sites of storage. During growth, iron must be absorbed and carried to the blood-forming organs for the manufacture of new red cells for the developing body. Between the first and the twenty-first year about 4000 mg. of iron are retained. Distributed over 20 years this amounts to an average retention of 1·8 mg. a day. Further, iron injected into animals or taken by mouth is stored in large amounts in certain internal organs,[40 54 73] and the post-mortem findings in hæmochromatosis show that during life there must have been continuous transport of iron from the gut to various parts of the body.[66 95]

In spite of the confusion about the amount and state of iron in the plasma [3 4 5 6 31 33 44 46 55 56 60 61 75 87 88 91 106 107] it is natural to suppose that the plasma is the medium for the transport of iron. This view is supported by the work of Bing and others [11] and of Heilmeyer and Plötner.[35]

Phagocytes, leucocytes, lymph, and other media of transport which have been suggested [93 112] scarcely seem sufficiently physiological or indeed efficient enough to provide for the demands of the body. This point of view and other arguments in its favour may be found set forth in a short article by Moore and Doan.[65]

The whole question of plasma and urinary iron, their relationship to each other, and their possible fluctuations during disease or treatment clearly require detailed and critical investigation.[11 35] Transport by the plasma suggests that an equilibrium exists between the storage organs, the plasma, and all the cells of the body. It also suggests that any variation detected in the amount of iron excreted, either by the intestine or in the urine, reflects a variation of plasma iron in the same direction. While recognising that some such generalisation as this must be true, our knowledge at present scarcely enables us to visualise the details.

5. *It is apparently possible in health to maintain adults in iron balance on any intake likely to be derived from natural foodstuffs.*[23]—Earlier work, in which negative balances were sometimes obtained,[48 97 101] has been confirmed by Barer and Fowler [28a] but not by other recent investigators. According to Lintzel [51] balances can be maintained, at any rate for a short time, on intakes as low as 1 mg. per day. Neither Fontes and Thivolle [26] nor Nicolayson [72] were able to maintain dogs in equilibrium on intakes as low as this, so that there may be species differences. There may also be age differences, for it has been shown that on their normal (small) iron intakes, babies were in negative iron balance during the first two months of life.[41 98] Lintzel [51] obtained iron balances on intakes up to 60 mg. a day, and Reimann, Fritsch, and Schick [85] found very slightly positive balances when 100 mg. of iron a day were administered to normal adults. The work of Dry,[21] Brock and Hunter,[15] and of Fowler and Barer [29a] strongly suggests that on intakes of 500–1000 mg. of iron a day positive balances would always be obtained.[53 86 99] It is true that positive balances were not obtained by Müller,[69] but a critical examination of the figures given by this author [70 71] suggests that there was something seriously wrong with his technique. One patient, for example, is reported to have had 4·05 million erythrocytes, and a hæmoglobin of 80 per cent. (Sahli). The blood iron was 148 mg. per 100 c.cm., and on an intake of liver plus 1·6 g. of iron daily the patient had a negative iron balance of over 2000 mg.

6. *There are characteristic differences between the iron exchanges and the blood picture of the two sexes.*—Women tend, even in health, to have less hæmoglobin in their blood than do men.[76 82] Further, they are much more frequently found to be anæmic. Davidson and others [19] in a study of the incidence of anæmia among the poorer classes in Aberdeen, found that among the men, even on low iron intakes, anæmia was conspicuous by its absence. Among the women, on the other hand, anæmia was found in nearly half the subjects. Associated with these observations, and possibly in part explaining them, is the fact that women lose 10–40 mg. of iron each month in menstruation[2 49 74]; pregnancy and parturition result in a loss of about 400 mg.

7. *Anæmias of the hypochromic type can be cured by the administration of iron, so that in these circumstances iron must be absorbed.*[8]—Small doses are sufficient in normal persons and animals, and in fact the absorption and utilisation of even the small amounts of iron in food may be extraordinarily efficient under these conditions.[105 115] Some anæmias can only be cured by enormous doses of iron, but it would be wrong to suppose that this is due to any failure of absorption, since it has been shown that when the intakes are high large amounts of iron are continuously being absorbed.[14 29a 30] Iron may be much better retained by anæmic than by normal persons.[85]

8. *It is believed that about 3·3 per cent. of the total hæmoglobin of the blood is destroyed every day.*—In a 70 kg. man this involves a katabolism of about 29 g. of hæmoglobin or 90 mg. of iron, some of which certainly passes through the inorganic state. This turnover of iron is of a very much higher order than the daily intake and output.

9. *Very little or no iron is excreted during or following sudden hæmolytic anæmias.*[7 22 58 67 86]—Much of the iron set free appears to be stored in the internal

organs, mostly in inorganic form.[67] The small negative iron balances obtained by Stearns and McKinlay[98] during the period of "physiological hæmoglobin destruction" can hardly be said to contradict this, for their own figures show that there was little change in the total amount of hæmoglobin in the babies' blood.

10. There are two diseases associated with an excess of iron in the body. In *hæmochromatosis* immense deposits of inorganic iron are found in the liver, pancreas, skin, and other parts of the body. Iron is not deposited in all these sites when it is forced into the body by injection.[66 81 95] Hæmochromatosis, therefore, is not simply due to faulty iron elimination, although this has been suggested.[21] It is important to note that in spite of the enormous deposits of iron in the organs there are usually subnormal amounts of hæmoglobin and of iron in the blood.[92] In *polycythæmia rubra vera* the number of red cells and the amount of hæmoglobin are very greatly in excess of normal, so much so that the amount of iron in the blood may be doubled. The red cells may be increased more than the hæmoglobin.[58] In other words, there may be signs of a deficient iron supply to the blood-forming organs. This is indeed not surprising when the demands which are being made upon the iron supplies are considered. In addition to these two diseases there are others in which there may be a great excess of iron in the solid organs. Pernicious and aplastic anæmia, and Cooley's erythroblastic anæmia[113 114] are good examples. It has not been proved in these instances that the total amount of iron in the body is increased. The deposition in the organs may have taken place entirely at the expense of the blood, and one must always remember that before death these cases have generally been treated with large doses of iron.

CURRENT THEORIES

"The site of absorption is the entire intestinal tract, although the duodenum and a portion of the upper intestine probably play the major rôle. . . . Elimination is almost entirely by intestine, especially by the colon. . . ."[89] This theory is really a legacy of the histologists of the nineteenth century,[1 37 102 105] although it has been strengthened on histological grounds from time to time,[12 83] and is still generally accepted.[20 102 108 109] The life and soul of this theory has undoubtedly been the fact that there is no morphological distinction between absorption and excretion.[104 108] To most people the term "excreted by the intestine" undoubtedly implies regulated excretion[18 32 59]—i.e., that the gut performs for iron the function which the kidney performs for sodium, amd with equal facility. It does not necessarily follow from this that iron is always being *freely* absorbed and excreted, but it is implied that *appreciable* absorption and excretion are always in progress.[24] When the accepted experimental data on iron metabolism are examined in the light of this theory, certain difficulties at once arise. These difficulties are intensified by a study of recent work on the function of the intestine. Thus, while the theory explains well enough the avenues by which iron leaves the body, and the results obtained from balance experiments at moderate levels of intake, it breaks down completely when examined in the light of the following considerations.

(*a*) Extensive intravital hæmolysis, however brought about, which is known to set free large amounts of iron in the body, does not appreciably increase the excretion.[7 58 67 86]

(*b*) When iron is injected into rats in such amounts that the normal iron content of the body is doubled, trebled or more, practically the whole of the injected iron may be recovered from the organs.[54] Gottlieb's[32] solitary experiment showing that guinea-pigs do excrete injected iron by the bowel, is still awaiting confirmation. If corroborated, it suggests species differences.

(*c*) If the body ever tended to excrete unwanted iron, it is difficult to explain why one should find such large quantities of free iron stored in the livers of patients who have died of pernicious anæmia. The iron has not been required for the formation of hæmoglobin (in such amounts) for many years. One would have expected, therefore, that it would have been slowly excreted if any organ of the body had the capacity or opportunity for doing so.

(*d*) If appreciable absorption takes place from the intestine every day and is followed by regulated excretion, it is not easy to see why simple anæmias only appear to arise when there is some drain on the body iron. Thus, men are very rarely anæmic[19] unless there is some chronic source of blood loss. Women are frequently anæmic, and there is evidence that the lower hæmoglobin level of so-called "normal" women may be pathological rather than physiological.[116] Why should this be so? Granted that their intake of iron is lower than that of men, and that they lose about 20 mg. of iron each month during menstruation, they have to absorb less than 1 mg. of iron a day to make good this loss. Surely the poorest of diets is sufficient to supply this. Again, why is anæmia[31a] so prevalent in women who have borne children if appreciable amounts of iron are absorbed each day?[10] If the intestine regulates iron excretion it should be able to conserve the body iron. The fœtal demands for sodium, which are supplied from the maternal blood, do not make the mother sodium deficient, even if her sodium intake is low, for her kidney conserves her body sodium to exactly the extent required.

None of these observations suggests an active regulatory excretion. Further, the best chemical work indicates that the large intestine does not excrete iron in appreciable quantities[45] and takes no part in regulating the amount of iron in the body.[72 111] This throws the onus of regulated iron excretion on to the small intestine,[45 59] but even this is rendered most improbable by Nicolayson's[72] experiments on dogs with isolated colons. In these animals no extra excretion of iron by the small intestine followed the daily injection of 67 mg. of iron.

A NEW THEORY OF IRON METABOLISM

While admitting at once that some of the iron in the fæces must come from excreted juices and abraded cells, and also that the amount and variability of the iron so excreted may vary widely from species to species, it is suggested on the basis of work already referred to that in man the quantity of iron lost in this way is small and constant (see also Christiansen[17]). Taken together with the accepted facts about the excretion of iron in the urine, it follows that the total excretion of iron is small and relatively fixed in amount.

Now obviously negligible and non-regulatory excretion, even with great storage capacity, must be coupled with limited and to some extent controlled absorption. The factors governing absorption must therefore be considered, and the simplest possible theory has been accepted in the first instance as the working hypothesis. The possible effects of

calcium, phosphorus, hormones, or vitamins on iron absorption or excretion will not be considered in any detail.[43 77 96] The same applies to the effect of the thyroid hormone or vitamin C on hæmatopoiesis,[9 25 84] and sexual differences in the storage of iron.[37a 100] It is accordingly suggested that the absorption of iron is conditioned mainly by the relative concentrations of free ionised iron in the intestine and in its epithelial cells.

The cells may actively prevent the outward diffusion of iron into the lumen, but in any case passage in this direction is probably very small for two reasons. Firstly, the concentration of free iron in the plasma, and hence probably in the intestinal cells, is always very low and maintained so by the efficiency of the storage organs. Secondly, it may be assumed that there is always some iron in the intestinal canal because all the secretions which are poured into it probably contain iron, and in the case of the bile this is certainly true.[36 42] Hence the diffusion gradient from cells to lumen can never be a steep one. Vice versa, practically no iron will be absorbed if the intake is very low because the concentration of free iron—at any rate in the small intestine—will never rise much above that of the free iron in the cells. Since, moreover, iron is a divalent or trivalent ion it is probable that it passes through the cells only with difficulty in either direction (compare SO_4 [39] and magnesium and calcium). Thus, small differences of concentration may develop and even be maintained for a time without appreciable passage of ions.

It follows from these considerations that the balances of intake and output that have been observed at physiological levels of intake are brought about by the absence of any significant absorption or excretion. With intakes large enough to be quite outside the physiological range positive balances would be expected and this has in fact been shown to be the case.[14 21 30 99]

It is suggested, therefore, that iron is excreted in very small amounts both by the bowel and kidney. The smallness of the excretion is due to the fact that the activity of the storage organs constantly maintains the plasma iron at a low level. It is doubtful whether the intestine has any power of regulating iron excretion. Iron is not freely absorbed. The amount absorbed depends upon the relative concentration of free ions in the lumen of the gut and in the cells and plasma. At physiological levels of intake only a very small fraction of the ingested iron is absorbed.

The new theory explains satisfactorily the observations which, as has already been shown, are difficult to reconcile with the current theories. Thus one would not expect to get much increased excretion of iron after intravital hæmolysis or after the injection of inorganic iron.

Since, under normal conditions, the human body is now considered to excrete practically no iron, the menstrual loss at once assumes a significance which was difficult to assign to it on the older theories. Women tend to be genuinely short of iron, and the shortage is accentuated by their low iron intakes. They are living, therefore, at a lower plane of iron metabolism than men. Additional iron by mouth raises the absorption from their intestines and their hæmoglobins reach a higher level. The theory similarly explains the hypochromic anæmias of multiparæ in whom the demands of pregnancy and parturition have more than replaced the menstrual loss. One must always bear in mind however the possibility that the tendency to anæmia in women may be accentuated by other factors. They may utilise the small amounts of iron which they do absorb rather differently from men.[37a 100]

Further, the new theory accounts reasonably well for the positive balances observed on normal intakes after hæmorrhage [28] and the positive balances which must occur to produce the accumulations of iron which take place in polycythæmia and hæmochromatosis. After a hæmorrhage or in polycythæmia the activity of the marrow so reduces the concentration of iron in the body cells and plasma that diffusion from the gut is sufficiently facilitated to allow appreciable absorption to take place. In hæmochromatosis the iron deposited in the cells is insoluble and inert, and takes no part in the general equilibrium. Hence there is a true deficiency of free iron, as evidenced first, by the anæmia, and secondly, by the cure of the anæmia by the administration of iron.

The absorption of iron during childhood may be explained along similar lines. The growing body and the active marrow maintain the concentration of free iron in the plasma and epithelial cells so low that absorption is appreciable with normal intakes. It remains to explain why absorption should become so much slower after the growth period. It is suggested that this is brought about by the rise of free iron in the epithelial cells consequent upon the reduced demands for cell and hæmoglobin formation. An increase of iron in epithelial organs at or about maturity has in fact been shown to take place by Zondek and Karp,[117] so there is experimental support for this view.

An important aspect of iron metabolism is the necessity for giving quite unphysiological doses of iron to cure certain anæmias common in clinical practice.[84] Recent work [14 29a] suggests that after treatment has been in progress for a short time there must be abnormally large amounts of iron in the body. It is tentatively suggested that these patients and those with polycythæmia rubra vera represent the opposite extremes of normality in marrow reactions to iron. In polycythæmia the marrow is overactive and hæmoglobin is too readily formed in the presence of normal, or even subnormal, amounts of free iron in the cells and plasma. How this could lead to the continuous absorption of iron has already been discussed. In the refractory secondary anæmias, the marrow is sluggish and can only be goaded into activity by the presence of high concentrations of free iron, and, owing to the activity of the storage organs, these can only be maintained by the continuous ingestion of huge doses.[14] It is to be noted that this theory does not suggest any reason for the activity or sluggishness [90] of the marrow.

CONCLUSION

As already stated it is quite impossible to evolve a theory to cover the absorption and excretion of iron which does not conflict with some of the published findings. The present theory is clearly open to criticism on many points and is likely to be so criticised. It is put forward, however, not with any suggestion of finality, but because it seems to offer a better explanation of the experimental and clinical findings, taken as a whole, than any other, and also because it indicates a number of points which clearly require investigation.

SUMMARY

It is suggested from a study of the literature that the capacity of the bowel to excrete iron has been

exaggerated, particularly its capacity to regulate the amount of iron which it excretes. There are indeed indications that in man and certain animals the bowel excretes practically no iron. If this is the case, the amount of iron in the body must be regulated by controlled absorption. The possibility of this and some of the factors likely to be concerned are discussed.

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LONDON HOSPITAL.—It has been decided to remodel the Buxton and David Hughes wards at this hospital to provide isolation accommodation for children. The house committee has reported that while there was satisfactory out-patients' accommodation for children the in-patient department had fallen behind the times. The school of massage and medical electricity has been incorporated in the department of physical medicine.

EXTENSIONS AT GOOLE HOSPITAL.—Extensions and alterations to this hospital have been made for the sum of £11,000 and have been opened by Mrs. Craggs. A new operating-theatre has been provided, the men's wards have been improved, and two new wards added.

NEW HOSPITAL FOR ST. AUSTELL.—It is proposed to build a new hospital in the field adjoining the old hospital, which will then be used to accommodate the staff. The building is to be of two storeys, and V-shaped to form a suntrap. The hospital is in the middle of the china clay industrial area and many accident cases are received.

INFECTIVE WARTS IN WORKERS USING BONE-GLUE

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PROFESSOR OF BACTERIOLOGY IN THE UNIVERSITY OF SHEFFIELD

In September, 1936, an outbreak of warts was reported from a cardboard-box factory. On investigation nine girls were found to have warts, mainly on the dorsal aspect of the hands and fingers, especially on the skin just proximal to the knuckles (see Figure). All nine girls during their work came into contact with bone-glue. Two other girls who also worked with glue had no warts. The remaining ten girls employed in the factory did not handle glue, because they worked only on cardboard stamping machines, and none of them had ever suffered from warts. All the workers used the same wash-basins, soap, and roller towels. The juxtaposition of these two groups of workers—all of whom handled cardboard and used the same washing accommodation—with the presence of warts only in the workers who came into contact with glue, suggested that the source of the infection or irritation was to be found in the glue. On further inquiry it was learnt that warts on the hands of a worker were first noticed about three years previously, and nearly all the affected girls gave a history of having had recurrent warts for at least two years. They had made individual and varying efforts to have the warts removed, some by going to hospital for treatment, some by the application of strong nitric acid, and some by taking large doses of Epsom salts, which is believed to be a specific cure for warts by removal of the "excess lime in the body." In nearly all cases, however, fresh warts appeared on the hands and fingers.

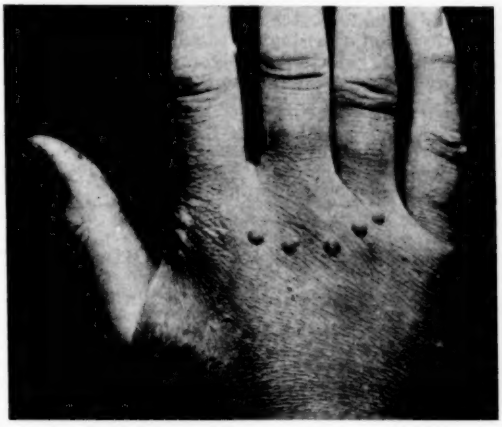
Typical cases were sent to Dr. Rupert Hallam, dermatologist to the Royal Hospital, Sheffield, and the was of the opinion that the warts were of the infective variety. Preliminary investigations had been made in order to determine whether the warts were caused by a chemical irritant. For instance, in this factory the glue gave a strongly acid reaction to litmus paper, whereas in another cardboard-box factory, where the only case of warts seen was in an office-worker, the types of glue used gave either alkaline or neutral reactions. The clinical diagnosis, however, that the warts were infective in type made it desirable to try to trace, by the method described below, the source and mode of infection.

AN INVESTIGATION

Two groups of volunteers (four in each group) were treated with the glue. One group was treated with glue obtained from the glue-pots used by the girls at their work, and the other group with glue which was of the same variety (obtained from the factory stock) but was made up in the laboratory and had not been handled by any of the workers. The glue in each case was applied once a week to the back of the left hand, where it was well rubbed in and left in situ for three or four hours. In addition a small piece of white lint about an inch square was soaked in the glue, applied with the aid of sticking-plaster to the outer surface of the left arm just above the elbow, and allowed to stay there for twenty-four hours.

The experimental treatment was begun in the middle of January, 1937, and because no warts had appeared by the end of March, the application of glue to the back of the hand was from then onwards carried out daily (Sundays excepted). Weekly applications to the upper arm were made as before.

The four persons treated with glue that had been made up in the laboratory showed no lesions; but of those treated with glue from the factory glue-pots three out of four developed warts on the dorsal aspect of the left hand. The first wart appeared at the beginning of May, 3½ months after the experiment had been begun. No warts developed on the upper arm in any of the eight cases. Dr. Hallam diagnosed the experimentally produced warts as being of the infective type. From these findings it was deduced that the wart-producing virus was merely carried by the glue in the factory glue-pots, and that it was not present in the stock of glue "pearls" or powder.



Characteristic distribution of the warts.

A series of temperature readings showed that when the glue-pots were on the water-jacketed heater, the temperature of the glue varied between 80° C. and 90° C.—i.e., well above the lethal temperature for the wart virus. When a glue-pot was taken to the work bench it remained there until the temperature had fallen to between 35° C. and 40° C. More than one worker used the same glue-pot, and it was noticed that the fingers and knuckle regions of the hands were constantly covered with glue. During their work they were frequently obliged to lift piles of cardboard boxes from the bench, and in so doing tended to abrade the skin over the knuckles. The girl who showed the greatest number of warts was the one whose duty it was to clean out the glue-pots at the end of the day's work, when the glue in the pots was usually at a low temperature. It is to be expected that she would run a greater risk of infection because her hands were exposed to glue from all the pots in the factory, and because the skin of her hands was exposed to a certain amount of friction during the cleaning process.

Once the fact was established that the glue-pots had been infected with wart virus, and were being reinfected by girls who had warts on their hands, it was comparatively easy to clear up the trouble in the factory. All girls suffering from warts were taken

away from work involving contact with glue and sent to hospital for treatment. They were not allowed to handle glue until the warts had entirely disappeared. No fresh or recurrent cases have arisen since this procedure was adopted.

CONCLUSION

From the above investigation we conclude that the glue became infected in the pots while they were on the working benches, because here it was at a temperature below the lethal point for the wart virus. The original infection had probably been introduced by a worker who had had her hands infected outside the factory. The factors which appear to have had an influence on the infection are: (1) the adhesive nature of the glue, which made for close and persistent contact of the virus with the skin; and (2) friction of the skin of the backs of the hands during work, which probably produced small abrasions rendering the skin more susceptible to infection, and determined the localisation of the warts.

We are greatly indebted to Dr. Hallam who gave us the benefit of his expert knowledge. We also wish to thank those members of the laboratory staff who allowed us to experiment on them with the glue.

FOOD AND FLUID IN TYPHOID FEVER *

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TOWARDS the end of the second or at the beginning of the third week of typhoid fever, one may be faced with *collapse* due, not to hæmorrhage, but to depletion of the circulation of necessary fluids. Of this, there are two causes, namely: (1) neuro-circulatory depression with lowered blood pressures brought about by toxic poisoning of bulbar centres and myocardium; (2) difficulty in getting the patient to swallow a sufficiency of fluids. Such collapse is easily mistaken for perforation, and needless laparotomy may be performed; it therefore deserves recognition as a complication to be anticipated.

The signs of collapse are: sudden sharp fall of temperature; sudden fall in blood pressures; anxiety; cyanosis of the skin; weak, running pulse; rapid breathing; rigor; but, as a rule, no restlessness. In the status typhosus, in which the intensity of the abdominal pain is much lessened by the extreme toxæmia and exhaustion of the patient, great care has to be exercised in discriminating between collapse and perforation. Two important differentiating signs are: persistence of "abdominal breathing" in collapse, its loss in perforation; and the greater intensity and localisation of the pain in perforation, with local rigidity and immobility of the abdominal wall.

Collapse may persist for three or four hours, even longer; if treated forthwith, the condition is not dangerous. If doubt remains, is laparotomy justifiable? I think it is.

FOOD AND WATER

In the treatment of typhoid, modern opinion is now mostly on the side of giving a more sustaining diet than the diluted three pints of milk in the twenty-four hours—admittedly meagre fare for anyone suffering for several weeks from typhoid fever. In addition to the diluted milk feedings, non-residue, easily assimilable, strained foods are now deemed necessary, not forgetting the accessory food factors with a sufficiency of water, and of salt. (The real value of salt as an accessory article of diet in typhoid fever has, in the past, been overlooked.) The question arises: should this fuller diet be given before the separation of the sloughs, or during the whole course of the illness? Feeding is none too easy during the first two weeks; later, more difficult still if tongue and mouth are not properly cared for. The cleansing of these and of the blocked nostrils is a ceremony which should be performed at regular intervals, using tooth-paste, peroxide of hydrogen spray, and boracic vaseline flavoured with peppermint, in that order, the last being applied by means of a soft badger-hair toothbrush. Aqueous and glycerin solutions, as commonly used for the purpose, are quite unsuitable.

It has been suggested that the cleansing of the tongue does away with what is a useful diagnostic sign of typhoid, even a valuable index of the condition of the patient; but this is an argument which carries little conviction nowadays.

James Alexander Lindsay of the Queen's University of Belfast used to teach that the "typhoid state" was sometimes due to lack of sufficient nourishment. This can readily be believed; but I submit that the condition is actually and in fact chiefly due to starvation of fluids. It is not possible to arrive at any true estimate of the line dividing normal hydration from dehydration. So far, no useful clinical means exist for the measurement of the fluid balance in the tissues, or in the body generally, except by the crude method of measuring intake and output. So far as output is concerned, this can be done only approximately. That loss of pressure and of volume in the circulating fluids occurs in typhoid is well known. The scanty, concentrated urine during the whole febrile period, with reduced output of chlorides, offers evidence of a generalised dehydration of tissues; perhaps, too, of a natural effort at retention of fluids more or less thwarted by the difficulty in feeding sufficient liquid to the apathetic patient. In a high proportion of all typhoid patients, diarrhœa, even alone, may speedily and seriously deplete the circulation.

THERAPEUTIC HYDRATION

From the beginning of the illness, it is surprising how many patients evince no great thirst; how the nurse has to force drinks upon them. Later, the sore tongue, dry mouth, and blocked nostrils may make the act of drinking and swallowing not only painful but almost impossible; so that the patient quickly shows the *effects* of lack of fluid, such as pyrexia, dehydrated skin, dry tongue, and parched mouth; scanty, concentrated urine with diminished salt content; low-pressure pulse; low blood-pressure readings; even a shrivelled, wasted appearance. It is my opinion that the fluid balance is as important to maintain as the diet. This can be done by feeding more fluid, by salting drinks (thereby also encouraging thirst), and very simply and readily by slow rectal continuous-drip (proctoclysis) by which means surprising quantities of fluid can be administered in the attempt to restore blood volume, to augment salt content, and to irrigate the tissues so as to wash out toxins as well as to counter their further absorption. It is a method which need not be confined to the few, but can be utilised generally in a ward, even for those in the typhoid

* Based on a contribution to the discussion on enteric fever held by the section of hygiene and public health of the British Medical Association at Belfast, July, 1937.

state who are incontinent—their very inertness makes the administration easy. If proctoclysis fails, then physiological salt solution can be given subcutaneously or by intravenous slow drip.

To maintain an effective hydration, sodium chloride must be balanced or increased, having the additional advantage of obviating to some extent what appears to be a temporary, toxic suprarenal failure with its sequel in lowered blood pressures, prostration, and general weakness. Such a condition is now known to arise from insufficiency of chloride in the tissues.

If the sodium chloride content of the blood-serum be allowed to drop below a normal level so, as a consequence, must its overflow into the urine, this reduction in the excretion of chloride being a useful clinical sign of salt insufficiency. Furthermore, a low salt content of the blood argues a high blood-urea—a combination threatening harmful possibilities. In practice, excess of salt with œdema is oftener recognised and treated than is its default with dehydration.

Rectal saline, given by the slow continuous-drip method, I have not seen bring about pulmonary œdema, although the eyelids and skin tissues generally may become puffy without apparent harm ensuing; indeed, I have repeatedly seen good follow its administration. It should be delivered slowly so as not—by over-filling as it were—to embarrass heart and vessels already toxic or to excite bleeding from the bowel. Probably, by the drip method, no more than is required by the body is absorbed. If œdema or undue puffiness develop, salt intake can be limited and hypertonic saline can be given by intravenous drip so as to reduce hydration by promoting diuresis. Still, the use neither of saline nor of glucose need be overdone, nor the body overtaxed by chloride excess. It is surprising how the filling-up of the circulation so as to maintain hydration cleanses tongue and mouth and adds to the comfort and well-being of the patient, at the same time making the act of feeding less irksome for him as well as less difficult for the nurse. One point to be noted is this: that whereas the hydrated patient in typhoid fever, whether taking plenty of liquids or having them administered as suggested, is often restless, the dehydrated patient shows no restlessness.

The Brand cold bath method of treatment, if made much use of abroad, has never found favour in the British Isles. It is interesting that the types of patient said to derive benefit from the bath treatment are precisely those benefiting by therapeutic hydration—i.e., those with dirty tongue and dry mouth; those with extreme pyrexia; those in the status typhosus; those suffering from severe, and from relapsing and prolonged, forms of the disease.

In the immediate treatment of collapse and circulatory failure, nothing seems to me to be more effective than full doses of the injectio adrenalini co., or of strychnine, or Coramine, repeated at short intervals as believed to be necessary. For constipation: in children, a good petroleum emulsion is best; in adults, an olive oil-soap-and-water emulsion enema, freshly prepared, is in every way better than the irritative simple enema. For diarrhœa, better than any drug, is colonic lavage with warm normal saline or plain water, and a suitably adjusted diet.

The mode of death most common in typhoid fever is usually believed to be from heart failure, by which is meant that the myocardium "peters out" from poisoning; but the more I see of typhoid death, the more I believe that this results rather from neuro-circulatory failure due to toxæmia and to poisoning of the bulbar centres, similar in many respects to that which so commonly causes death in acute pneumonia.

Clinical and Laboratory Notes

A CASE OF SEVERE TOXIC JAUNDICE IN LATE PREGNANCY WITH RECOVERY

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According to Weiss (1935) catarrhal jaundice is an infectious disease, and acute yellow atrophy of the liver is an aggravated form of it. Cases of severe jaundice with toxic symptoms in pregnancy are rare and usually fatal, and therefore such a case with recovery appears worth recording. In the following case the history and clinical signs show such undoubted evidence of severe damage to the liver cells as to put it into the category of acute necrosis.

HISTORY OF CASE

A married woman, aged 40, was admitted to the Radcliffe Infirmary as an emergency on the night of Jan. 16th, 1937. She had three children, the youngest 2½ years old; all had been normal pregnancies and labours, and she had had no past illness of any significance. The present pregnancy was 37 weeks advanced, and the patient had been well until two weeks before. At this time several members of the family had influenza and the patient herself became ill and started vomiting. She had however no sore-throat, limb pains, headache, or pyrexia, all features of the epidemic of influenza at the time. Four days before admission she was vomiting large amounts of often typically coffee-ground material, and three days before admission there was blood in the result of an enema. She gradually became drowsy and jaundice was noticed on the day of admission. There had been no fœtal movements for three days.

On admission there was one large coffee-ground vomit. Examination showed the patient to be semi-comatose and restless. She could be roused to give answers to questions, but resented this and the answers appeared quite undependable. The pulse was soft and the rate 120. Temperature 98·0° F. and blood pressure 110/90 mm. Hg. Jaundice was very deep when seen in good artificial light. Tongue glazed and dry. The uterus was 4 fingers-breadth above the umbilicus but no fœtal heart could be heard nor movements felt. The size of the liver was difficult to determine before delivery and the area of dullness appeared normal. It was tender on palpation. The heart and lungs showed no abnormality. The urine was reduced in amount and contained bile pigments, albumin, acetone, pus, granular casts, and *Bacillus coli*.

Treatment.—The membranes were ruptured at once under gas-and-oxygen anæsthesia, and greenish liquor escaped, and immediately afterwards 3 pints of 10 per cent. glucose saline were given intravenously with 10 units of insulin. 10 c.cm. of 10 per cent. calcium gluconate were given intramuscularly. The calcium was continued daily for four days.

Progress.—The patient was restless all night and retched, but no actual vomiting occurred. She was delivered at 11 A.M. next morning of a recently dead fœtus after an easy labour. She was still drowsy, but more on the spot and intelligent in answering questions. She was taking fluids in sips by mouth. Bowels opened with an enema, stools normal in colour. The liver was more easily palpable and found to be enlarged about three fingers-breadth below costal margin. Three days later the jaundice was unaltered, but there had been no further vomiting and she was perfectly normal mentally. The van den Bergh reaction was positive delayed direct, and the icteric index 37. A blood count showed:—

Red cells	5,000,000	Differential:	
Hæmoglobin	70 %	Polymorphs	66 %
Colour-index	0·7	Lymphocytes	21 %
Leucocytes	8900	Mononuclears	13 %

By the end of a week the patient was definitely better, but began to run a slight temperature. This was

considered to be due either to the urinary infection, or to inflammation at the sites of injection of calcium gluconate. Jaundice disappeared between two and three weeks after its onset, and the patient was discharged one month after admission perfectly well. When seen again five months later she had been in excellent health all the time, and the following investigations on July 13th showed that recovery has been complete. Van den Bergh reaction (direct and indirect): negative. Icterus index: 11 units (normal: under 8). Takata-ara reaction: negative. Lævulose-tolerance test: no impairment of hepatic function as demonstrated by ability to utilise lævulose. Wassermann and Meinicke reactions: both negative. Radiography: gall-bladder normal.

DISCUSSION

Toxic jaundice occurs at its worst in pregnant women, and, according to Rolleston and McNee (1929), when the disease is fully declared the prognosis is very gloomy, and "in fact some doubt of the diagnosis will always arise in those cases that recover completely." In the case recorded the possibility of the jaundice being of obstructive or hæmolytic origin was naturally considered, but the suddenness of the onset and the severity of the symptoms, and the lack of a sufficient degree of anæmia to account for such severe jaundice excludes this. The van den Bergh reaction, positive delayed direct, is also in favour of a toxic cause.

Typically, the disease begins in two stages, the first lasting five to six days with gastro-intestinal disturbance and malaise, and the second characterised by the typhoid state and nervous symptoms, with severe jaundice and vomiting. The vomiting is persistent and may contain altered blood, and the fæces are dark. The pulse is rapid and feeble and of low tension. At the onset of grave symptoms the liver may or may not be enlarged and tender. The urine is of high colour, and contains bile, albumin, and casts.

About half the number of recorded cases in women have happened halfway through or towards the end of pregnancy. The condition is also known to follow certain infections, such as typhoid fever, pneumonia, influenza, and syphilis. In this patient influenza may have been a precipitating cause. An infection of the urine was also present, but this was not heavy. As far as is known the toxic agents chloroform, arsphenamine, and phosphorus can be entirely ruled out as contributing causes, and there appeared to be no likelihood of Weil's infection, as the patient had recently removed to a new house free from rats and near no water.

The experiments of Whipple and Sperry show that repeated administration of chloroform to dogs is followed by hyaline necrosis of the central 3/5ths of each hepatic lobule. The extent of this has been determined by the removal of a piece of liver tissue on the day following the last anæsthesia. The animal recovers completely, and examinations of the liver made at the end of one, two, and three weeks have shown that repair is almost complete after two weeks, whereas at the end of three weeks the liver has returned to normal.

A combination of bacteria and a poison produce a lesion closely resembling acute yellow atrophy in man. Neither poison nor bacteria alone can cause exactly these changes (Opie 1910), and bacteria such as *B. coli* which have little pathogenicity for the normal animal are virulent for the animal whose liver has been injured by chloroform or phosphorus.

The existence of pregnancy is known to throw a considerable strain on the liver, which would make it more vulnerable to infections of any kind, whether general such as pneumonia, or local such as an ascending infection from the duodenum. In the case under discussion the fœtus had probably been dead three days, and was expelled within 36 hours of the onset of jaundice. The dehydration was made good, and calcium was supplied by intramuscular injection. Birch (1937) has recently published a case of severe toxic jaundice occurring in a man extremely ill with pneumonia. Large and frequently repeated injections of glucose saline and insulin and calcium gluconate were given until the patient had had 4790 c.cm. of 30 per cent. glucose, 980 units of insulin, and 20 c.cm. of calcium gluconate solution in 10 days, and eventually recovered. The suggestion is that if cases of toxic jaundice are supplied with adequate amounts of these substances over a long enough time, recovery may follow in a case which would otherwise be fatal.

I wish to thank Dr. W. D. Sturrock, obstetric physician to the Radcliffe Maternity Hospital, for permission to record this case, and the staff of the pathological laboratory for the investigations involved.

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ARSENICAL INTOLERANCE AND THE TREATMENT OF *TRICHOMONAS VAGINALIS* INFECTION

BY C. G. H. CAMPBELL, M.D. Camb., D.P.H.
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AN increase of interest in vaginal infection with *Trichomonas vaginalis* has drawn attention to the value of the pentavalent arsenical compound acetphenarsine, or "190," in the treatment of this condition. Since drugs of this type are now being very freely used, and can be obtained under various proprietary designations from any qualified chemist without a doctor's prescription, it has been thought that the following experience may be of interest and may possibly throw some light upon certain toxic eruptions of which the cause has not been found.

A. B., aged 38, commenced treatment for sero-positive primary syphilis in September, 1926. After four injections of Neokharsivan (3 grammes in all) at weekly intervals, a widespread, irritating erythema appeared, which progressed in two weeks to a generalised exfoliative dermatitis. Four days after the first appearance of the rash the patient developed jaundice with enlargement of the liver. These conditions gradually improved under treatment with sodium thiosulphate, and by the end of January, 1927, the patient was free from jaundice and was discharged from hospital. After a long interval, treatment for syphilis was resumed with bismuth preparations, and all blood tests have now been negative for several years.

Recently this patient has been attending the London County Council (Whitechapel) Clinic on account of a vaginal discharge in which *Trichomonas vaginalis* has been identified. For this infection Stovarsol was used as a local application: two 4-grain tablets were inserted daily into the vagina. After five days of this treatment the patient reported at the clinic with an itching, macular, erythematous rash on the face, neck, trunk, and limbs. Stovarsol was discontinued and an injection of Ametox (sodium thiosulphate), 10 per cent. solution, 10 c.cm. was given. Two days later the eruption had extended and the condition of the patient demanded admission to hospital. Nine days after admission there were large patches of fading erythema confluent over a great part of the trunk,

back and front. These areas were desquamating in coarse scales, most marked on the extensor aspects of the forearms, fingers, legs, and ankles. On the face and neck the erythema had faded, but there was a fine desquamation. The skin of the palms of the hands was thickened.

Arsenical preparations of the acetphenarsine group are not without toxic effects in hypersensitive patients, and these may be of an insidious type and give rise to difficulties of diagnosis; so it may be of interest to note the possibility that they may be readily absorbed per vaginam and may in some cases provoke constitutional reactions.

I have to thank Lieut.-Colonel E. T. Burke, director of the L.C.C. (Whitechapel) Clinic, for his permission to publish this case.

CYSTICERCOSIS AS A POSSIBLE CAUSE OF EPILEPSY IN AN INDIAN

By M. Sambasiva Rao, M.B. Madras, M.R.C.P. Edin., D.T.M.

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The first case of epilepsy in an Indian caused by *Cysticercus cellulosæ* was reported by Minchin (1937) and this is perhaps the second.

A Hindu coolie, aged 28, was admitted to hospital in May, 1937, having had sudden jerking movements of the left forearm three days previously, lasting for about a minute, with headache for some hours subsequently. There was no aura or loss of consciousness, no history of similar fits before, and no relevant family history.

He had two similar fits in the ward, each consisting of jerking movements limited to the left forearm and has not had a fit for two months since. The rarity of idiopathic epilepsy commencing so late and the strictly localised nature of the fits suggested an organic cause.

Blood for Kahn test was negative, blood pressure was 120/80 mm. Hg, and there was an eosinophilia of 5 per cent. Stools showed no ova and the urine was normal. There was no ocular paralysis and the fundi were normal. Grip, gait, jerks, sensations, &c., were normal. He was accustomed to eating pork but denied having ever suffered from tapeworm.

A thorough search was made over the whole body and a cyst was found embedded in the right deltoid. He said that he had had the nodule for 20 years. It was dissected out and a typical uncalcified cyst of the size of a large pea with the milk spot was removed. It was split open and showed under the low power a scolex with four suckers and a double row of hooklets.

Skiagrams were taken from head to foot but did not reveal any calcified cysts although a nodule was just palpable on the right trapezius.

Points of interest in this case are: First, the long time the cysts remained without calcification; that in the right arm was 20 years old. Secondly, the lack of history of intestinal tæniasis indicating an external infection. Another patient seen in Edinburgh, an ex-soldier from India, also denied having ever suffered from tapeworm. The majority of MacArthur's (1934) cases are similar. It is too soon to say whether this seeming antagonism between the bladder-worm and the adult stages of *Tænia solium* is of any significance.

My thanks are due to Dr. J. Fryer, district medical officer, for allowing me to investigate this case, and to Dr. R. J. Dyson, chief medical officer, for permission to publish the report.

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BRITISH MEDICAL ASSOCIATION

SECTIONS OF MEDICINE AND SURGERY

Prof. W. W. D. Thomson (Belfast) presided at a joint meeting of these sections when Dr. L. S. T. Burrell (London) opened a discussion on

Abscess of the Lung

He confined his remarks to the single abscess such as occurs for no apparent reason or as a result of pneumonia, ruptured empyema, embolism, or aspiration. In a series of 199 cases of this type 43 resulted from pneumonia, 32 were associated with bronchial carcinoma, 23 with septic foci in some distant part of the body, and 2 followed tonsillectomy. The first symptoms, said Dr. Burrell, are malaise, a nasty taste in the mouth, and offensive breath and sputum; hæmoptysis may occur. The temperature is usually raised and may be hectic in character. Clubbing of the fingers appears early. The sputum may contain elastic fibres and pyogenic organisms Clinical signs may be absent unless the abscess is superficial when there may be an associated pleurisy. Radiography is essential, using antero-posterior, oblique, and lateral films. Stereoscopic films are apt to be misleading. The prognosis is serious; death may occur from extension into lung tissue, toxæmia, hæmoptysis, or embolic spread to some distant part, usually the brain.

Dr. Burrell held that medical treatment should be given a good trial—lasting at least six weeks—before operation was decided on. Postural drainage used in the proper manner might suffice to bring about recovery. Artificial pneumothorax had fallen into disrepute owing to the possibility of rupture into the pleural cavity. If there were no pleural adhesions it was a safe method. Aspiration through a bronchoscope was worth trying though it should not be continued unless there was improvement. Surgical treatment consisted in opening the abscess and draining it. The operation should be performed in two stages, the first to produce adhesions between the chest wall and the pleura over the cavity, and the second to drain the abscess. The procedure was associated with definite dangers such as hæmorrhage and cerebral abscess and should therefore not be treated lightly. Injections of alcohol, serum, and sodium benzoate had been recommended, as also had an intensive course of arsphenamine in gangrenous cases on the assumption that this condition was of spirochætal origin. Pre-operative dental treatment was of value in reducing pulmonary complications.

Mr. J. E. H. Roberts (London) spoke of the importance of the early diagnosis of the condition and of its localisation by X rays and lipiodol. These abscesses were generally close to the surface of the lung, though that did not mean they were necessarily close to the chest wall and they might lie close to a fissure, the diaphragm, or the mediastinum. In the early stages they had no attachment to bronchi; later there was erosion into bronchi with partial drainage shown by the fluid-level. Surrounding the abscess there was fibrosis and endarteritis. As to treatment, postural drainage was sometimes successful, but it must be intelligently used, the abscess being first localised and the best position determined for its drainage. Bronchoscopic suction might be effective but should not be used as a routine or without postural drainage. Pneumothorax, drugs, and short-wave diathermy were not only useless but pneumothorax was dangerous. Of other operative measures drainage could be carried

out either in one or two stages according to the condition of the pleura. If the pleura was adherent or white and if the periosteum of the resected rib was thick it was probably safe to perform the operation in one stage, but in doubtful cases two stages were safer. The abscess could be located with a needle through the wound, and when it had been found the needle should be left in position as a guide to the incision in the lung. The abscess should be cleared out, the roof removed by diathermy, and the cavity packed. The first dressing should be carried out in the theatre and the cavity inspected to make sure that no pockets of pus escaped notice at the operation. Cyclopropane could be used as the anæsthetic unless diathermy was contemplated. A radiogram should be taken after operation to ascertain that drainage is adequate and to exclude the formation of new abscesses. In early cases conservative treatment should be tried for six weeks if the patient was not too ill, otherwise operation should not be delayed. If the patient's condition was not very grave lobectomy should be tried—also in cases of persistent discharge after the attempted drainage

Dr. PETER KERLEY (London) emphasised the fact that areas of collapse in regions remote from the abscess might confuse diagnosis. An inhalation abscess might develop on the opposite side and radiograms should therefore be taken often—i.e., once every three days. The tomograph was useful in diagnosis and localisation. It was occasionally difficult to distinguish an abscess from a carcinoma which should be suspected in the absence of pneumonitis on one wall and when enlarged mediastinal glands and phrenic paralysis were evident. The amount of surrounding pneumonitis was a valuable guide to prognosis.

Dr. CARL SEMB (Oslo) agreed with much that Mr. Roberts had said. Operation in his view should not be delayed too long.

Dr. GEOFFREY MARSHALL (London) said that lung abscess was more common, and better results were obtained from its treatment than statistics seemed to show; a number of patients living in the country must recover spontaneously without being diagnosed. Morphia by dulling the cough reflex might be a factor in the onset of a lung abscess. Two patients who coughed up their abscesses during transport had prompted him to try the method of percussion with postural drainage, which had been beneficial in some cases. Bronchoscopy should be performed once at least on the chance that it might prove useful. A leucocyte count was often of prognostic value.

Dr. W. BURTON WOOD (London) preferred natural drainage by the postural method combined with bronchoscopic suction if necessary. He showed radiograms of several patients treated by this method with a good end-result, and one of a patient who did badly after operation.

Prof. E. W. ARCHIBALD (Montreal) said that the bacteriological findings as well as the amount of surrounding pneumonitis were of use in estimating prognosis.

Mr. G. R. B. PURCE (Belfast) said that lung abscess probably arises both from aspiration of infected material and from emboli. He drew attention to the cultivation of streptococci from the blood by Okell and Elliott in 30 out of 40 patients five minutes after the extraction of septic teeth. The bacteriology of lung abscess, he added, was confusing. In the putrid type of abscess an anaerobic streptococcus was associated with *B. fusiformis* and a spirillum. In America *Bacterium melaninogenicum* had been incriminated. None of the cases treated surgically in his series of 66 had developed cerebral abscess. Bronchoscopy sometimes enabled bronchial neoplasm to be excluded. Radiograms were essential and lipiodol was sometimes useful. Bronchoscopic suction had not in his experience made much difference. If most of the abscesses were peripheral, it was difficult to understand how any but very big ones communicating with a large bronchus could even be reached. The abscess appeared to be growing and to be surrounded by more pulmonary infiltration accompanied possibly by signs of widespread pleural involvement and a septic type of temperature. Operation was imperative and should be done without delay even within the first six weeks of the illness. After operation it might sometimes be necessary to maintain a permanent fistula. In the series studied 26 had conservative medical treatment with a mortality of under a third, and 26 had an operation after medical treatment had failed to improve them; a third of these had died.

In reply, Mr. ROBERTS said the mortality-rate of lung abscess was very high. Since conservative medical treatment led to cure in only 30–35 per cent. of all cases he believed that patients not progressing favourably under conservative treatment should have an operation within the first six weeks at least and possibly still earlier.

SECTION OF HYGIENE AND PUBLIC HEALTH

Prof. W. J. WILSON presided at a meeting of this section when Dr. JOHN RITCHIE (Dumfries) opened a discussion on

Enteric Fever

from the standpoint of one concerned with the health of a rural area. His theme was the application of established principles to the prevention of enteric under the changed conditions of modern life. He said that although enteric had become a clinical curiosity, formidable epidemics still arose. These epidemics might be water- or milk-borne, or they might arise concurrently from both sources. The carrier state threw light on many otherwise inexplicable outbreaks. Improved sanitary administration had reduced the danger of massive food infection, while the hospitalisation of enteric cases reduced the risk of direct spread, even in parishes in which there had been no appreciable improvement in sanitation. If the disease was to be kept in check in rural areas persistent effort must be directed towards the protection of water and food (especially milk) from the specific infection.

The water-borne epidemic was usually the result of a massive infection. This explained the clinical incidence of enteritis in the community before the appearance of enteric fever. Cases of paratyphoid associated with typhoid usually pointed to gross contamination. The milk-borne epidemic, on the contrary, was usually due to a small pollution operating in a good culture medium. The control of the water-supply in order to obviate any risk of an epidemic was a matter of finance. In small rural areas the problem was difficult to solve; the sanitary staff available was inadequate both in numbers and in training. In many parts of the country there still existed sources of water-supply and sewage systems which had not been kept up to date; these presented a real danger. In rural areas also, in spite of repeated warnings, the auxiliary water-supply was often used for drinking purposes. The control of the water-supply should be made a regional rather than a local responsibility. Milk-borne epidemics might be due to polluted water used in washing the utensils, or might

be started by a single victim of a water-borne infection. The elimination of the carrier as well as the active case led to many practical problems, for the recognition of the carrier was sometimes difficult. Dr. Ritchie held that the authorities should have power to remove proved carriers from food trades. In his view enteric fever should be treated in hospital wherever possible, and every outbreak should be studied continuously by an expert bacteriologist.

Dr. S. WATSON SMITH (Bournemouth) followed with a paper based for the most part upon his experience during last year's outbreak of typhoid fever in Dorset and Hants. He first described the early symptoms and differential diagnosis of the disease, noting the value of a slow pulse and enlargement of the right lobe of the liver (especially in children) as early signs. About the ned of the second week signs of collapse were apt to appear; these might be wrongly attributed to hæmorrhage or to perforation. Collapse might persist for 3–4 hours and if promptly treated was not dangerous. If the interpretation of the symptoms was in doubt, laparotomy was justifiable. As regards treatment, great stress should be laid upon proper feeding. The need to maintain fluid balance called for "therapeutic hydration" from the outset of the illness (see p. 686). The avoidance of salt depletion was also important. Both fluid and salt could be supplied by salting drinks or by slow rectal feeding. Dr. Watson Smith's results with sera were equivocal.

Lieut.-Col. C. H. H. HAROLD (London) discussed the epidemiology of water-borne typhoid fever. He emphasised the need for constant watchfulness, giving historic and modern examples to support his point. He showed how recent years had witnessed a change in the incidence of typhoid, from large cities to small communities. He observed that rapidly growing areas were danger zones; that paratyphoid epidemics could seldom be traced to water; and that fly-borne epidemics might resemble water-borne ones. The early part of the Bournemouth epidemic resembled a water-borne infection. Discussing bacteriological control, Lieut.-Col. Harold emphasised the value of Wilson and Blair's medium in the examination of raw waters and effluents. The chances of successful isolation were greater when the use of an inhibitive medium was followed by direct plating.

Dr. GEORGE CHESNEY (Poole) also paid a tribute to the value of Wilson's medium. He discussed the epidemiology of the Bournemouth epidemic. The source appeared to have been a carrier who caused the infection of a stream. It was far from clear how the milk became infected. The cows might have been the connecting link between the stream and the farm in one or more of three ways: (1) external infection of the teats by the water of the flooded stream might have infected the milk; (2) a particular cow which died early in August might have been the source; (3) the cows might have acted as carriers of the organisms. These hypotheses opened up a number of lines for further research.

Dr. C. J. MCSWEENEY (Dublin) submitted some remarks on serum treatment in which he brought up to date a previous communication [1] by the addition of more recent material. The use of the serum was confined to severe cases. In two-thirds of the cases the effects were classified either as excellent or definitely good. He hoped that it would be possible to produce a more concentrated serum.

Dr. S. H. COOKSON (Bournemouth) also reported favourable results from the use of the serum in serious cases. Controlled experiments were unfortunately impracticable.

Dr. A. GARDINER ROBB (Belfast) found it difficult to interpret the results which he had observed after the use of the serum in 120 typical cases.

Mr. A. FELIX, D.Sc., outlined work on the antigenic structure of the typhoid bacillus and the significance of the various antigenic components in infection and immunity. A special antigen, called the "Vi" antigen, had been demonstrated in the typhoid bacillus which was associated with its virulence; its corresponding antibody was a powerful protective agent. The "O" antigen, though also essential for virulence, appeared to be chiefly responsible for the toxic symptoms, and the "O" antibody was an indicator of the content of endotoxin-neutralising bodies in the serum. Two conclusions of practical importance seemed therefore to be quite obvious: (1) antityphoid vaccine must contain "Vi" antigen in its least damaged form; and (2) therapeutic antityphoid serum must contain effective amounts of "O" and "Vi" antibodies. Dr. Felix demonstrated a table showing that all the commercial antityphoid sera which he had tested so far were entirely devoid of the "Vi" antibody and very poor in "O" antibody; in the mouse-protection test these sera were of no protective value whatsoever. He thought it quite possible that the sera prepared 30 years ago by Chantemesse and Macfadyen might have been of therapeutic value, because they were prepared by methods which did not destroy the labile "Vi" antigen. These methods, however, had been abandoned long ago and the commercial antityphoid sera produced according to the customary methods of immunisation with killed bacilli or extracts did not contain any Vi antibody. Up to the present it had not been possible to dispense with the use of living bacilli in the immunisation of the horses. Dr. Felix gave a brief account of the results of the clinical trials conducted abroad with the new antityphoid serum, prepared in the serum department of the Lister Institute at Elstree. In 1934, in Palestine, the therapeutic effects of the antityphoid serum were compared with those following the administration of normal horse serum. In 1935, in Cairo, a specially prepared pure "O" immune serum was compared with a serum containing both "O" and "Vi" antibodies. The results clearly indicated that the most beneficial effects on both the toxæmic symptoms of the disease and the pyrexia were produced by the serum containing the two antibodies. In connexion with the determination of the typhoid-carrier state he mentioned that, according to the results so far obtained, "Vi" agglutination seemed to be of real aid to an early diagnosis of chronic typhoid carriers, whereas "H" and "O" agglutinations were of little if any value.

Dr. R. J. MAULE HORNE (Poole) recounted his clinical experiences during the Poole epidemic. He also believed hospital treatment to be essential. The mortality experienced amongst cases treated in hospital in Poole was very low.

Dr. F. MARY ERSKINE (Belfast) read a paper on the

Incidence of Goitre among School-children

Goitre was three times as common in inland areas as in coastal ones. It was more prevalent in the country than in towns. Two factors working together appeared to result in the production of goitre. The first was infection (especially an infected water-supply, resulting from defective sanitation), and the second an insufficient iodine intake. These two factors could explain the regional distribution of the cases in Ulster. Nutrition and diet were important factors which needed more study.

[1] *Lancet*, 1935, **1**, 1095.

REVIEWS AND NOTICES OF BOOKS

Tumors of the Nervous System

An Investigation of the Most Recent Advances. Editorial Board: EDWIN G. ZABRISKIE, ANGUS M. FRANTZ, and CLARENCE C. HARE (proceedings of the Association for Research in Nervous and Mental Disease). Vol. XVI. Baltimore: Williams and Wilkins Co.; London: Baillière, Tindall and Cox. 1937. Pp. 493. 34*s*.

THE collection of sixteen papers here published were contributed to a discussion on tumours of the nervous system by the Association for Research in Nervous and Mental Disease at its annual meeting in December, 1935. Six are concerned with the gliomata. Of considerable value and importance is the survey of 210 verified gliomata by A. Elvidge, Wilder Penfield, and W. Cone (Montreal). In general they adopt the classification of Bailey and Cushing but they suggest a few modifications, particularly as regards the astrocytomata. The existence of protoplasmic astrocytomata is denied while a distinction is made between fibrillary astrocytomata arising in the vermis and lateral hemispheres of the cerebellum; the latter are said to have an average age-incidence of 34·2 years whereas that of the vermis examples is only 3·5 years. There are, however, only seven cases in each class. The astrocytomata as a whole are divided histologically into (1) the pilocytic or piloid type, with elongated hair-like cells, (2) the gemistocytic or gemästete type composed of plump astrocytes, and (3) astrocytoma diffusum. This subdivision appears to be justified on clinical and pathological grounds. The most favourable type is (1) which usually occurs in the cerebellum, (2) and (3) being confined to the cerebrum. J. W. Kernohan and E. M. Fletcher-Kernohan (Mayo Clinic) review 109 cases of ependymoma from both clinical and pathological aspects; this is probably the largest series of this type of tumour to be studied in any single clinic. An important if somewhat depressing chapter is that which deals with the effects of irradiation in the gliomata; C. H. Frazier and B. J. Alpers (Philadelphia) analyse the data provided by 15 clinics in the United States. The criteria adopted were based upon the histological effects observed. The difficulties met in attempting to correlate the results were obviously formidable, this form of therapy being still in an empirical state. It appears that the cells in medulloblastomata, generally regarded as the most uniformly radiosensitive of these tumours, show wide variations of radiosensitivity and regenerative ability. There is unhappily no consensus of opinion concerning the radiosensitivity of spongioblastoma multiforme. This remains an outstanding problem in neurosurgery since this tumour, the common malignant glioma of adults, is seldom susceptible to radical surgical treatment. In their analysis the authors do not take into consideration the site or depth of tumours of this type; many are deeply seated in the corpus callosum and basal ganglia and this must surely influence their response to irradiation. A cinematographic demonstration of the tissue culture of gliomata by R. G. Canti, J. O. W. Bland, and D. S. Russell (London) is described. This film, the last on which Canti was engaged, shows the morphology and movements of tumour cells in three types of glioma: astrocytoma, oligodendroglioma, and spongioblastoma multiforme. An examination by L. Eisenhardt of the post-operative survival periods recorded in the Brain Tumor Registry of Yale University reveals some remarkably encouraging figures in many groups. An important contribution from J. H. Globus (New York) on the classification and morphology of the meningiomata is beautifully illustrated with photographs of macroscopic and microscopic specimens. He stresses the part played by vascular elements in the formation of these tumours and subdivides them upon a developmental basis. In dealing with tumours and cysts of the cerebellopontine angle, L. Alexander (Boston) gives a detailed account of the anatomy of the foramen of Luschka. He holds that cystic deformity of this region may play a part in causing Ménière's syndrome. But if this were correct we might expect to find a high incidence of this syndrome in cases with an adhesive, or residual, meningitis. Other interesting chapters deal with tumours of the peripheral nerves, diagnostic measures in intracranial surgery, and the metabolism of nervous tissues.

Die Hirnkammerformen bei Hirntumoren

By Dr. OTTO DYES, Dozent für Röntgenheilkunde, Würzburg. Leipzig: Georg Thieme. 1937. Pp. 79. RM.18.00.

THIS is a study of the variations of shape and displacements observed in the ventricles of the brain by the method of encephalography when a tumour is present. It might be described as an atlas since there are 105 figures in the text, mostly encephalograms of outstanding merit. Dr. Dyes begins by describing the technique of encephalography and the results obtained in the normal subject. Abnormal appearances are divided primarily into those that are symmetrical (arising from closure of the foramen of Majendie, cerebellar tumours, tumours of the pons, stenosis of the aqueduct of Sylvius, or a tumour in the hind part of the third ventricle) and those that are asymmetrical. The latter are fully described in their effects both upon the anterior and posterior horns. The anterior horns are displaced with relative ease since they are more remote from the moorings of the brain to fixed points, such as the tentorium. Dr. Dyes demonstrates four types of ventricular displacement corresponding to four possible positions, or zones, of a hemisphere tumour in the coronal plane. This kind of analysis should help the surgeon in localisation and may well come to play an increasing part in encephalography. The volume finishes with sections on intraventricular tumours, cystic tumours, and the uses of encephalography in early diagnosis.

Modern Psychology in Practice

By W. LINDESAY NEUSTATTER, B.Sc., M.B., B.S., M.R.C.P., Clinical Research Assistant to the Department of Psychological Medicine, Guy's Hospital. London: J. and A. Churchill. 1937. Pp. 299. 10*s*. 6*d*.

"DOWNRIGHT psychiatry for practitioners" would designate this book better than the title chosen for it. Dr. Neustatter has undoubtedly aimed at avoiding humbug; he is therefore direct and clear, though not always elegant in his style. His occasional sallies, which show that he takes neither his subject nor himself too seriously, lend vivacity to a sensible and reasonably comprehensive little manual, certain to be useful to "the uninitiated" for whom it has been written, and not without profit or interest for the more instructed reader. It is divided into five sections: the first dealing with psychopathology, the second and third (which are the longest) with

details of the individual disorders of children, and adults, and the next two with methods of treatment and such general themes as ætiology, the relation of psychological to general medicine, and legal and administrative procedure. Treatment receives proper attention throughout; this should commend the book to those many practitioners who seek guidance in this respect.

Diagnosis of Nervous Diseases

Eighth edition. By Sir JAMES PURVES-STEWART, K.C.M.G., C.B., M.D. Edin., F.R.C.P., Consulting Physician to Westminster Hospital and to the West End Hospital for Nervous Diseases; Physician to the Royal National Orthopædic Hospital. London: Edward Arnold & Co. 1937. Pp. 842. 35*s*.

The Basis of Clinical Neurology

The Anatomy and Physiology of the Nervous System in their Application to Clinical Neurology. By SAMUEL BROCK, M.D., Associate Professor of Neurology, College of Medicine, New York University; Senior Attending Neurologist to the Neurological Institute of New York. London: Baillière, Tindall and Cox. 1937. Pp. 360. 21*s*.

THESE two books afford an interesting contrast in methods of expounding the diagnosis of nervous diseases. Sir James Purves-Stewart's text-book, which with its eighth edition enters its fourth decade, has long held an authoritative position in medical literature. Its design has not been altered. After two introductory chapters on physiological anatomy and one on methods of case taking, each of the subsequent chapters is devoted to one principal symptom of nervous disease, the diagnostic significance of which is discussed in a series of clinical sketches illustrated by brief case reports. The author is a master of compact and lucid exposition, and the reader has the sense of being present at a clinical demonstration by an expert. All experts, however, are apt to make their achievements appear easier than they really are, and the novice must be warned that neurological diagnosis is not as simple as Sir James Purves-Stewart's book might lead him to think. It is, perhaps, Sir James's only fault as a teacher that he carries lucidity a little too far. For example, many authorities have not yet accepted the contention that Cushing's syndrome is due to "anterior basophil superpituitarism." It is therefore premature to attribute any clinical syndrome to "anterior basophil subpituitarism." The weight of the evidence, moreover, is in favour of ascribing Fröhlich's syndrome to a lesion of the hypothalamus rather than to "bi-lobar subpituitarism."

Since almost all neurological disorders have many symptoms, a good deal of repetition is unavoidable unless the main account of a disease is to be presented somewhat arbitrarily under the heading of a single symptom. The alternative method of expounding neurological diagnosis is that adopted by Dr. Samuel Brock. Neurological diagnosis being ultimately applied anatomy and physiology, Dr. Brock aims at presenting neuro-anatomy and especially neuro-physiology mainly from the standpoint of clinical usefulness. Beginning with the peripheral nervous system and the reflex arc he works upwards through the spinal cord to the brain stem, cerebellum, diencephalon, basal ganglia, and cerebral cortex. At each level he describes clearly the anatomical facts necessary for an understanding of normal and disordered function. The physiology is up to date, and Dr. Brock has carefully avoided dogmatism about problems which are still unsolved by presenting alternative views. At the end of each chapter is a list of the more important references. The student, before or after qualification, will find in this book all that he needs as a basis for his clinical studies. Having laid his foundations with the help of Dr. Brock he can proceed to build on them assisted by Sir James Purves-Stewart.

Physiology and Pathology of the Heart and Blood-vessels

By JOHN PLESCH, M.D. Budapest, M.D. Germany, L.R.C.P. & S. Ed. & Glasg., Professor of Internal Medicine in the University of Berlin. London: Humphrey Milford, Oxford University Press. 1937. Pp. 188. 15*s*.

WHILE harbouring a secret suspicion that the relation is too good to be true, most biologists, whether from prejudice or experience, prefer to see mathematics playing second fiddle to biology, as in Prof. Hogben's "Mathematics for the Million," rather than taking the lead. Consequently, a book which begins with the sentence, "By applying the principles of hydraulics to the circulation of the blood certain fundamental mathematical formulæ may be deduced," starts with a severe handicap. (No bookmaker would waste his earnings on a volume entitled "How to find the winner of the Derby by the Infinitesimal Calculus.") Perseverance, however, here brings a reward. When Prof. Plesch's formulæ have been either digested, or passed undigested, a wealth of information and provocative reasoning is manifest in his book. Mathematics lapses after the first chapter, and recurs only sporadically, and the "formulæ" have little or no bearing on the argument, which can be readily understood by accepting the author's definitions and allowing him occasionally to abbreviate them in the form of symbols. His book ought to be studied by everyone interested in the circulation and its disorders. The early part contains certain paragraphs which are difficult to follow until ensuing chapters have been read; for instance, two apparently contradictory statements occur on pages 7 and 9 which are not reconciled until page 44; while the use of sound velocity in measuring the distensibility of arteries is referred to on page 19 and not explained till page 60. The arrangement of the physiological half of the book might have been better. Such defects, however, are relatively unimportant in a monograph which contains much of value. The author's object is to show how many circulatory phenomena can be explained on purely mechanical grounds. The importance of reflexes and hormones is not denied, but it is urged that any effect which they produce must have certain definite physical consequences, and that until the circulation as a mechanical system is understood we lack the foundation on which to build a complete visual image of the various changes which take place. The reader will be shocked at our lack of knowledge of certain fundamental quantities, and may be surprised at some of the approximations here made; but he will be forced to think seriously and examine very critically the grounds on which his own preconceived notions rest. Physicians will find of interest in the second half of the book not only Prof. Plesch's interpretation of such conditions as œdema and arteriosclerosis, but many practical suggestions on methods of diagnosis and treatment. The book is a closely knit whole; on many points judgment will be reserved, but no one can fail to be impressed by the sound common sense of the approach or the value of the conclusions to which he is led by the author's forceful logic.

Les méthodes chirurgicales du traitement de l'angine de la poitrine

By MARCEL BÉRARD. Paris: Masson et Cie. 1937. Pp. 384. Fr.60.

THIS is a critical review of the various surgical operations tried during the last twenty years for the relief of anginal pain. In the clinics of Strasbourg, Boston and other American centres, Dr. Bérard has had excellent opportunities to examine patients after operation, and though the technique of the several interventions is not described his account of the results obtained is absorbing. Several important points emerge. Sympathectomy definitely relieves pain in selected cases of angina pectoris, the period of relief in some cases being reckoned in years. The operation is safe in skilled hands but, as might be expected, some patients die later of heart failure. Paravertebral injection is also safe and will often control pain. Total thyroidectomy is discussed in detail; apparently thyroid feeding is not always effective in controlling post-operative myxœdema. Dr. Bérard favours, on theoretical grounds, attempts to remedy the root cause of angina pectoris—cardiac ischæmia—by grafting; he reviews the first series of cases, operated on by C. S. Beck, with some emphasis on the high immediate mortality of the operation.

This book should be studied not only by surgeons who, disregarding the warning issued by Sir James Mackenzie some years ago, are attempting the active relief of angina pectoris but by that larger body of conservative physicians who hold fast to Mackenzie's teaching in this respect.

Human Understanding and its World

A Study of Societies. By K. W. MONSARRAT, Consulting Surgeon, Royal Northern Hospital, Liverpool. University Press of Liverpool; London: Hodder and Stoughton. 1937. Pp. 480. 15*s*.

ONE of the troubles about philosophy is that thought is always in advance of language and it necessarily follows that if a man has some very fresh thought to give the world he may have difficulty in finding adequate words for it. Mr. Monsarrat's book is the fruit of very wide reading and, we doubt not, of much reflection; much of it is interesting to read and provocative of new ideas and points of view about subjects as diverse as Hosea and the electron. We are quite doubtful whether we have grasped the central thesis round which the chapters are grouped. It seems to be that we must think of everything in terms of doing rather than being, that function overwhelms form. But that may be only part of the tale the author wants to tell.

Modern Treatment in General Practice

Vol. III. Edited by CECIL P. G. WAKELEY, D.Sc., F.R.C.S., F.R.S.E., Senior Surgeon, King's College Hospital; Editor, *Medical Press and Circular*. London: *Medical Press and Circular*. 1937. Pp. 436. 10*s*. 6*d*.

THE 51 articles of the third volume complete this series of reprints from the *Medical Press and Circular*. With the advance of surgery and the increase in the complexity and exactness of medicine in an ever-increasing number of the more serious complaints, one function of the family doctor must be to make a diagnosis at the earliest possible moment and refer the patient to a suitable expert at a curable stage. As H. A. T. Fairbank says in this volume in his account of congenital dislocation of the hip, "it is essential, from the patient's point of view, that the general practitioner should be familiar with the clinical signs of the condition and should realise what can be achieved in the way of treatment by those who have the necessary training and experience." This has been the guiding principle throughout these articles, so that many deal as much with diagnostic methods as with treatment proper, and aim at describing enough of the details and results of operative procedures to enable the practitioner to assess their value and explain them intelligibly to his patients. Some of the subjects dealt with, it is true, appear to lie outside the scope of general practice, for example, such highly specialised matters as the surgery of tumours of the pituitary gland and the treatment of œsophageal obstruction; and some methods of treatment are included which have not achieved general acceptance, such as the selenide treatment of advanced cancer. But on the whole the three volumes provide convenient and up-to-date summaries of the treatments which the general practitioner wants to know about.

Curieterapia in Dermatologia

By Prof. VINCENZO PALUMBO, Director, Italian Radiotherapy Institute. Belluno: A. Salvador. 1937. Pp. 87. L.30.

Prof. Palumbo begins his book with the usual section on physics. He includes a table showing the absorption of soft and hard beta and gamma rays in media of varying densities, another giving the constant of the uranium radium series, and yet another extremely elaborate one setting out the dose in millicuries destroyed or in milligramme hours obtained over periods from one hour to 15 days from applicators containing from 0·66 to 300 milligrammes of radium element. He describes the measurement of gamma-ray dosage made by Mallet and Danne and notes the relationship of the D unit suggested by Murdoch and Stahel to the "r" unit. In the section on biophysics nothing new emerges but it is a good summary of work which has been generally accepted. The most interesting section is that on the treatment of skin diseases. X radiation has been much used in Italy for inflammatory conditions, but the extension of radium therapy to large areas is a new idea. Descriptions are given of alpha, beta, and gamma therapy. Excellent results are claimed in the treatment of all forms of acne, alopecia areata, eczema, hypertrichosis, psoriasis, sycosis, and the tuberculides, and radium has also been used with success for temporary epilation in ringworm and favus. The dose for the inflammatory conditions is that which has been found to produce temporary epilation but is sometimes stated in terms of epilation and sometimes in terms of skin erythema dose. The other skin lesions whose treatment is described are those more usually treated by radium—squamous cancer, basal-cell cancer, angioma and keloids—and the illustrations show how effective treatment has been. Unfortunately, although the author tells us in the section on physics that the dose must obey the physical rules and that to this end full details must be supplied, he omits to give full details of any of his treatments, with the result that one is left with little idea of how the cure of the varied and numerous skin diseases is obtained. The reader must wonder what use is to be made of the physical tables if the physical dose is to be entirely disregarded when practical treatment comes to be considered.

THE LANCET

LONDON: SATURDAY, SEPTEMBER 18, 1937

THE HUMAN HEART

THE papers of BOURNE, SCOTT, and WITTKOWER, concluded this week, clarify the clinical view [1] that emotional state and personality go far to determine the nature and severity of the symptoms produced by ischæmic heart disease. No clinician has ever doubted that the discrepancies often observed between the signs and symptoms of different patients must be related, in part at least, to their psychological make-up. Dr. WITTKOWER's studies, recorded on another page, represent an attempt to probe this matter a little more deeply and to carry the description of people with disproportionately severe symptoms beyond the adjectives "nervous" and "sensitive." A logical approach to an estimate of the part played in any disease by psychological factors is the comparison, in groups with and without the disease, of the incidence of the psychological states suspected of influence. Dr. WITTKOWER and his colleagues pursuing this path have discovered a striking excess of long-standing anxiety states in a group of patients, with or without organic disease, who complained of cardiac symptoms, as compared with another group undoubtedly suffering from organic heart disease but without symptoms. Dr. WITTKOWER's investigations of what Dr. BOURNE still prefers [2] to call "angina innocens" show clearly that this condition is really one of anxiety hysteria. No better argument could be found for the opinion [3] that to qualify the word "angina" by calling it "innocent" or "false" is about as likely to carry conviction to this type of patient as clapping a halo on Mr. WALLACE BEERY and calling him SHIRLEY TEMPLE is likely to carry conviction to a cinema audience. On the other hand, to name the condition "anxiety hysteria" is to expose the patient to that barrage of criticism and useless advice which is both the painful fate of many neurotics and a source of difficulty in treating them.

But troubles of nomenclature are not the only ones surrounding the conditions known as "left inframammary pain" or "neurocirculatory asthenia." Dr. DORIS BAKER [4] has shown that sighing respiration, precordial tenderness, and palpitations form a syndrome which is organically benign and undoubtedly related to anxiety. There is no reason why a few of these patients should not develop ischæmic disease of the heart—anxiety has indeed been held by some to predispose to this—but surely the intelligent course of action with them is not to fix a neurosis by mentioning this disability but to deal with the anxiety state that is the cause of the presenting symptoms? For this purpose, examination by a psychologist has at least two virtues. To begin with, it satisfies the need for proper diagnosis, since in the absence of open or latent anxiety the presence of precordial pain still suggests the possibility of an organic lesion that may be dangerous; and secondly, even if treatment of the anxiety state is less than completely successful, it may at least teach the patient to distinguish—as intelligent victims of neuroses generally do—between pain whose degree or type they know to be related to chronic emotional states and pain whose organic basis may demand the immediate attention of a physician. Investigations such as these show clearly that the problem of how to integrate the newer psychological knowledge with general medicine is perhaps best solved, in this generation at least, by clinical collaboration between physician and psychiatrist. There is no real unwillingness nowadays to coöperate, but undoubtedly difficulties remain. Most doctors have tried to study and understand the modern psychological outlook; few of them are satisfied with the result of their efforts. In this unfortunate impasse there are various factors, outstanding among them being the jargons and the differences of the psychological schools. Dr. WITTKOWER has shown that it is unnecessary in an exposition designed for clinicians to use any but simple technical terms, which he defines clearly; we hope that the lesson will not be lost on his fellow psychologists.

There are deeper difficulties in the integration of psychology, but they are not likely even to be faced, much less overcome, if physicians and psychiatrists meet only over patients with late and severe mental disorders. In many aspects of general medicine psychological factors are of specific importance: patients suffering from such diverse conditions as chorea, diabetes, asthma, colitis, peptic ulcer, hypertension, hyperemesis gravidarum, and postural deformities have all been described at different times as "nervous"; and immensely laborious studies have been made on the psychological side of the clinical puzzles which these disorders present. Dr. FLANDERS DUNBAR'S compendious summary [5] of what has lately been written on psychosomatic problems, published two years ago, illustrates, partly in its bulk and partly in the uneven quality of the work summarised, both the interest aroused in clinicians of all countries and the unsatisfactory state of medical understanding. Psychological work with patients is complex and time-consuming, whether it is diagnostic or therapeutic, at hospital or in private. In consequence little psychological research in general medicine can be done unless it is specially subsidised. Dr. WITTKOWER's paper is the first fruit of the work on psychosomatic relations that has been endowed at the Tavistock Clinic by the Halley Stewart Trust and the Rockefeller Foundation. It should draw the attention both of those who conduct and of those who endow research to a field from which a therapeutic harvest might be gathered with relative ease.

[1] Bramwell, J. C., *Lancet*, Sept. 11th, 1937, p. 632.
[2] Bourne, G., *Brit. med. J.* 1937, **1**, 695, 887, and 1138.
[3] See *Lancet*, 1930, **1**, 1299.
[4] Baker, D., *Lancet*, 1930, **1**, 1280; 1934, **1**, 174 1936, **2**, 787
[5] Dunbar, H. F., Emotion and Bodily Changes, New York, 1935.

FEVER THERAPY FOR GONORRHŒA

THE uses of fever induced by physical means are being explored with unabated enthusiasm in the United States. Up to date the best results have been obtained in gonorrhœa and its complications, and here at all events fever therapy has passed the experimental stage. There are various ways of bringing the patient to the required temperature, but it now seems to be agreed that the type of apparatus employed is less important than the experience of the doctors and nurses using it. From the beginning good results have been got with methods embodying very different principles and it has been felt that each school of thought could learn a good deal from the others. At the International Conference on Fever Therapy held in New York City last March the varieties of apparatus in common use were exhibited and some concern was expressed lest their commercial production might lead to unskilful handling on the one hand and unhelpful rivalry on the other. The two main groups are those that employ the principle of external heat (e.g., hot baths, electric blankets, radiant-heat cabinets, and air-conditioned cabinets) and those that rely upon the penetrating qualities of high-frequency waves or induced high-frequency currents. NEYMANN of Chicago, who is one of the pioneers of fever therapy, believes that "penetrating heat" is superior to external heat, since the latter produces an "unphysiological" state of affairs in which the temperature of the skin is higher than that of the viscera. He and HOLMQUEST [1] hold that electropyrexia gives "approximately normal conditions" in which "a biological tissue will function better." They say also that external heat causes abnormally high pulse-rate and quote two independent investigators in support of the statement that the pulse-rate is relatively independent of visceral temperature, but bears a direct relationship to skin temperature. Further evidence is adduced to show that the capillary pulse volume is greater and the amount of perspiration less with external heat than with the penetrating heat. Most of these statements seem, however, to be based on theory and, although interesting, hardly warrant the conclusion that internal heating is safer and more comfortable than external heating. Moreover, though NEYMANN and HOLMQUEST employ electromagnetic induction to establish fever, they have borrowed the methods of the air-conditioning experts for maintaining the temperature. In this country we have little or no experience of these various techniques and must form our judgments from what is told of them. So many favourable accounts have been given of the air-conditioned apparatus known as the Kettering hypertherm that we should hesitate to condemn it on the rather slender evidence that NEYMANN and HOLMQUEST offer.

PARSONS, BOWMAN, and PLUMMER,[2] for example, have found this hypertherm thoroughly satisfactory for the induction, maintenance, and control of fever. Their object was to decide whether fever is more, or less, effective than the ordinary remedies for gonorrhœa, and whether it requires a longer or shorter time for cure. Their patients were 87 young soldiers, all of whom were isolated, rested, and kept under strict control; 43 were treated with fever and 44 by the ordinary methods. Fever was induced for five hours at a time, at temperatures of 106·6°–107° F., every third day, and at least one treatment was given after the patient was apparently well. The decision as to cure was based on clinical grounds and on absence of gonococci and excess of leucocytes from smears of prostatic fluid for thirty days, during which isolation was enforced; this was followed by weekly observation under normal working conditions, all the reported "cures" being under observation at least five months. The patients were divided into three groups: (1) those with uncomplicated gonococcal urethritis, (2) those with acute infection of the prostate with or without other complications, and (3) those with chronic prostatitis. The dividing line between acute and chronic infections was arbitrarily fixed at ninety days from the onset of the disease. In the first group were 22 patients, 11 of whom received fever and 11 ordinary treatment. The time of treatment in the fever-treated group averaged twenty-seven days, as compared with eighty-one days in those treated with irrigations. In each group 8 cures were obtained; but whereas 3 of the control patients had residual (presumably non-gonococcal) prostatitis after "cure" there were no such after-effects in the fever group. In the second group 28 patients with acute prostatitis and complications were treated, 14 with fever and 14 with irrigations. The fever group (12 cures) averaged twenty-two days of treatment as compared with eighty-four days in the control group (10 cures). In the series with chronic infections 18 were treated with fever and 19 with irrigations. The former averaged twenty-eight days of treatment (16 cures) and the latter a hundred and five days (6 cures). The authors attribute the failures of fever therapy, with one exception, to errors of judgment and inadequate treatment; but it should be noted that the average age of these men was only 27 and PARSONS and his colleagues think few patients above the age of 40 would tolerate these high temperatures with safety.

In their treatment of gonorrhœa in the female BIERMAN and HOROWITZ [3] are more drastic. They quote an observation that various strains of gonococcus will survive at 106·7° F. for periods ranging from six to thirty hours, and since this is about as high a temperature as a patient can safely stand they supplement the fever with local heating of the pelvic organs. Their procedure—which they describe as "strenuous and not without danger"—is to raise the systemic temperature by means of short-wave currents while the patient lies in a lamp-heated cabinet. At about 106° F. local diathermy is applied to the pelvis, with vaginal electrodes, and for an hour or two this is

[1] Neymann, C. A., Holmquest, H. J., *Med. Rec.* 1937, **145**, 327.
[2] Parsons, E. H., Bowman, P. N., and Plummer, D. E., *J. Amer. med. Ass.* July 3rd, 1937, p. 18.
[3] Bierman, W., and Horowitz, E. A., *Amer. J. Obstet. Gynec.* July, 1937, p. 68.

supplemented by pelvic short-wave; the object is to raise the vaginal temperature to about 109°–110° F., while the general temperature is held between 105·5° and 106·5°. A total of 121 women have been treated in the past six years, with success in 113 (93 per cent.) and no deaths or serious complications. In the last 54 cases, in which the systemic temperature was raised for about twelve hours at a time with about seven hours of additional pelvic heating, the gonococcus disappeared after an average of 1·4 treatments. BIERMAN and HOROWITZ think that the otherwise healthy adult—unless she is pregnant—can be treated in this way at any stage of a gonococcal infection, even when there is acute salpingitis with fever and pelvic peritonitis. Women with acute salpingitis at the time of treatment have sometimes shown normal tubal patency afterwards; since some of the cases treated have been followed for five years the investigators are satisfied that the disappearance of gonococci is permanent, and a number of their ex-patients have had children. In conclusion they say that "the outlook for the woman with gonorrhœa has been brightened by the development of the combined heating procedure here described. A rapid eradication of the gonococci can be achieved in most cases, and without danger of extension of the disease."

THE CONTROL OF NOISE

NOISE has come to mean any sound that is undesired by the hearer, and its undesirability depends upon such factors as its intensity, quality and pitch, the background against which it is heard, and its environment, as well as upon the hearer's taste and state of mind, his health and his occupation at the moment. Estimation of the absolute noisiness of a given sound is therefore clearly impossible, and the most that can be done is to measure its loudness in relation to its background as heard by a normal ear. While agreeing that the composition of the sound has to be considered, Mr. G. W. C. KAYE, D.Sc., has come to the conclusion that "sheer loudness is the determining factor in most cases of annoyance caused by noise." This opinion, expressed in a presidential address to a section of the British Association early this month, may not be acceptable to psychologists; for they are apt to lay more emphasis on individual abnormal reactions than on stimuli. But there can be no question that a large proportion of people are more likely to be annoyed by big noises than by small ones; and where measurement is required the problem, as he says, "largely resolves itself into the correlation of the sensation of noisiness (as assessed by the ear) with the associated energy, which can be quantitatively measured by physical instruments."

The human ear is sensitive to a range of oscillatory pressures from 0·001 dyne per square centimetre, below which no sound is heard, to 1000 dynes, above which pain is felt in the ear. In order to cover this vast range a logarithmic scale of intensity is used, the unit being one "decibel," which represents a definite fractional step, 26 per cent., in sound energy, and is roughly the smallest change of intensity that the human ear can detect. The intensity of a sound, being a purely physical matter, can readily be measured by means of microphones, but loudness is a psychological concept, and its measurement must depend upon aural observations by human observers. The method employed is to adopt a standard noise and to vary its strength on a known scale of energy units until it is judged to be as loud as the noise being tested. For this purpose a pure tone of frequency 1000 cycles per second, about two octaves above middle C, has been chosen as the standard, and the zero has been placed near to the threshold of audibility of the 1000 cycle tone. If a noise when tested is found to match the standard when the latter has an intensity of n decibels above zero, the noise is said to have a relative loudness of n "phons." On this scale the human ear has a range of from 0 to 130 phons, a quiet whisper has a loudness of about 20 phons, ordinary conversation 60 phons, and a pneumatic drill 100 phons. The adoption of this standard has made it possible to construct noise meters by which the equivalent loudness of any given noise can be read off on a scale, and these will very much simplify the devising and enforcement of legislation to suppress noises that exceed an agreed acceptable standard. Dr. A. H. DAVIS, of the National Physical Laboratory, in a recent addition to the "Changing World Library"[2] gives an account of the progress which is being made both at the laboratory and by private firms in reducing, absorbing, or excluding noises of all kinds, and the non-technical reader will be delighted to learn from him how, with a certain financial outlay, he can attain quietness though his home is next door to a boiler factory.

A less hopeful outlook confronts those to whom not only the loudness of adventitious noises but music in any form constitutes an unpleasant and, when prolonged, an almost unbearable experience. The poetic tradition that they are, to say the least, untrustworthy neighbours, maligns them; they are usually patient if unhappy ones. Their number seems to be growing—or is it merely that nowadays they dare to confess their aversion, braving alike the contempt of those whose trained appreciation of fine music is delicate without being fastidious, and those others who turn on the wireless as a routine on entering a dining-room or even a library? The present cult of the gramophone by the young has one advantage over that of the pianoforte imposed on their predecessors—it requires no practice—and the tunes emitted from any one instrument are thus as a rule, but not always, more varied. But the production of what might be termed a negative acoustic is desirable to bring relief where it appears to be most needed—by the occupants of flatlets, who have no control over the sounds inflicted upon their unwilling ears and have no other room.

[1] *Nature*, Sept. 11th, 1937, p. 446.

[2] Noise. By A. H. Davis, D.Sc., Principal Scientific Officer in Physics Dept. of National Physical Laboratory. London: Watts and Co. 1937. Pp. 148. 2*s*. 6*d*.

ANNOTATIONS

THE PITUITARY AND GASTRIC SECRETION

SEVERAL years ago Prof. E. C. Dodds and his associates [1 2] reported in these columns that animals injected with posterior pituitary extracts developed necrosis of the acid-secreting area of the stomach. The dose of vasopressive principle necessary was extremely high and it was not possible at that time to assess the significance of the phenomenon. Subsequent research in the same laboratories, however, has brought to light new facts, of considerable physiological interest, which have now been described [3-6] in detail. The first aspect of the problem to be examined was the effect of the extract, in doses more nearly approaching physiological levels, on the secretion of gastric juice. Gastric fistulæ were established in animals and secretion was provoked by various stimuli such as histamine, insulin, sham-feeding and pilocarpine. It was found that whatever the stimulus, the response could be reduced by injections of pressor extracts of pituitary tissue. It was also found that these extracts inhibit the normal response of the pancreas to secretin. The fact that barium chloride was observed to have a similar effect suggested that they exerted their effect by constricting the gastric vessels. The experiments were accordingly repeated in animals so prepared that gastric secretion and blood-flow through the stomach could be measured simultaneously. It was found that the increased secretion caused by the stimuli mentioned was always attended by an increase in blood-flow, and that when the pituitary extract was given blood-flow, as well as secretion, was checked. Secretion is not simply a function of blood-flow, however, because vasodilatation, induced by warming the stomach, did not lead to increased secretion. In a further series of animals the experiments were repeated after hypophysectomy and it was found that in such animals the normal correlation between secretion and blood-flow was disturbed. These experiments throw light on the necrotic lesions which follow larger doses of the vasopressive principle. The pronounced effect of the latter on gastric circulation, and the fact that barium salts cause similar lesions, indicate that vasoconstriction plays an important part in causing these lesions. The importance of the vascular factor is also suggested by Byrom's observation [7] that infarcts which are demonstrably ischæmic in origin can be produced in the kidneys by injections of posterior pituitary extract. There is little occasion for surprise that such enormous doses of so powerful a vasoconstrictor should lead to ischæmic necrosis. The interest lies in the localisation of the necrosis, in the case of the stomach, to the oxyntic area. The work of Dodds and his colleagues helps to explain this localisation. They find that necrosis does not occur if the stomach contents are kept neutral, and since the inhibitory effect of the vasopressive principle is directed mainly to the volume rather than the composition of the gastric juice it is evident that the presence of acid in the stomach at the time when secretion is inhibited forms an essential condition to the development of necrosis. Whether these experimental lesions bear any relation to gastric ulceration in man remains to be seen, but new light on the mechanisms governing gastric secretion can hardly fail to be helpful sooner or later in the study of gastric disease.

[1] Dodds, E. C., Noble, R. L., and Smith, E. R., *Lancet*, 1934, **2**, 918.
[2] Dodds, Hills, G. M., Noble, and Williams, P. C., *Ibid*, 1935, **1**, 1099.
[3] Dodds, Noble, Scarff, R. W., and Williams, *Proc. roy. Soc.* B, 1937, **123**, 22.
[4] Cutting, W. C., Dodds, Noble, and Williams, *Ibid*, p. 27.
[5] *Ibid*, p. 39. [6] *Ibid*, p. 49.
[7] Byrom, F. B., *J. Path. Bact.* 1937, **45**, 1.

EDUCATION OF BACKWARD CHILDREN

UP to the present time only a few education authorities have made special provision for backward children and a pamphlet issued by the Board of Education on the subject [1] may serve as a stimulus to effort in this direction. The pamphlet is essentially a plea for the early discovery of backward children in the schools, for their individual study, and for suitable treatment. The term "backward" is used in the sense of educational backwardness, whether due to inherent dullness or to extraneous causes, but the main part of the argument relates to the former class which is by far the largest. Backwardness is of course not entirely an intellectual matter. Slowness in acquiring the interests, social attitudes, skills and habits of civilised life may have physical, emotional, or environmental causes. Intelligence quotients (I.Q.), therefore, which measure actual or potential power of abstract thought do not express the whole personality. The pamphlet is chiefly designed to give hints to teachers on the best methods of teaching particularly those children whose powers of abstraction and generalisation are limited and for whom practical experience of the concrete is more essential. Emphasis is laid on the desirability of cultivating the child's natural interests, providing reasonable freedom of movement and activity, and of training on practical rather than on academic lines. These children are not essentially different from their normal fellows and therefore the methods of education applied to them should not be radically different. Opportunities of mingling freely with children of higher intelligence than their own, it is stated, should be within their reach. While the suggestions of method are primarily intended for the dull group with I.Q.'s over 70, they are meant to be applied also to the feeble-minded who are only an extreme degree of the dull group. "It will probably be found," it is remarked, "that the methods of teaching dull children which are recommended will be equally helpful in dealing with children who are even more retarded." The implementation of this suggestion would hardly be compatible with the "special school" system under which the children are usually separated educationally from their normal fellows. In this pamphlet there is merely casual reference to the fact that "feeble-minded children when discovered are placed by some local education authorities in special schools." Those who have no occasion for studying legislation in this respect would scarcely guess from this statement that it is a statutory duty imposed upon local education authorities first to discover the feeble-minded, and secondly to provide special schools for them.

Under the Hadow scheme of reorganisation the provision for the education of the vast majority of backward children is regarded as satisfactory. For the rest, reference is made to experiments going on in certain areas. By ignoring the contribution made by the special schools to the problem of the education of the dull, the pamphlet may be expected to raise controversy. While few may dispute the desirability of abolishing the application of the term "mentally defective" to certain grades of educable dull children

[1] H.M. Stationery Office. 1937. Pp. 68. 1s.

many will stoutly oppose any suggestion of their removal from special schools. The view that segregation of groups of children suffering from hampering defects does them harm appears, however, to be increasingly held and to pervade this pamphlet.

A NEW OPERATION FOR PHTHISIS

TEN years ago Babcock [1] described an operation for aneurysm of the thoracic aorta in which he constructed an arteriovenous anastomosis between the common carotid artery and the internal jugular vein. Bennett [2] has this year reported a case in which Babcock performed the operation on a patient with advanced bilateral phthisis. The result was a substantial improvement, both symptomatic and general, but ten months later a pulsatile swelling developed at the site of the anastomosis and a second operation became necessary at which the anastomosis was obliterated by proximal ligature. After this the patient's condition deteriorated and he died within a year.

It is claimed that the general hyperæmia of the pulmonary circuit which follows jugular-carotid anastomosis may help to arrest the tuberculous process and also that the continuous addition of arterial blood to the venous blood in the lesser circuit should diminish the rate and amplitude of the respiratory movements. There are many practical and theoretical objections, however, to the general use of this operation in the treatment of pulmonary tuberculosis. Serious harm might be done by the sudden interference with the vital mechanism of the carotid sinus which is one of its inevitable results, and not everyone will agree that increased diastolic filling of the heart is to the organ's advantage. At the same time the method is one of extraordinary interest. All other operations for pulmonary tuberculosis have aimed at a local effect—the collapse of a patent cavity, the incision of a cavity, or even the removal of a portion of diseased lung. Even the rather indirect operation of ligature of the pulmonary veins from a lobe of the lung was designed to counter the disease in that particular lobe. It is this local nature of the surgery of pulmonary tuberculosis that excludes a large number of patients from its possible benefits even when it is clear that conservative therapy cannot preserve their lives.

THE PROGRESS OF MEDICINE

Dr. Simon Flexner went as a student to the School of Medicine at Louisville in 1887 and in an address [3] delivered at the celebration of the centenary of the school last April he surveys the shifting pageant of American medicine as he has seen it during fifty years—years which have covered a revolution in medical education and something like a revolution in medical practice such as we have hardly experienced in this country. The modern developments of American medicine are, he says, of German origin, partly through the physiologists such as Johannes Müller, and the chemists who believed in laboratory work such as Liebig, and mainly at a later period through Virchow's morbid anatomy and Cohnheim's experimental pathology, which started off W. H. Welch and Mitchell Prudden, whose book on bacteriology met Dr. Flexner in 1889. Another landmark he notices is the foundation of the Johns Hopkins University and Hospital in 1876 and Huxley's inaugural address which urged the necessity of a preliminary training in science for medical students, and he rightly attaches great importance to the freedom with which the senior staff were collected up and down the country with no other consideration than their suitability. Early in this century the example of some of the eastern schools showed up the deficiencies and worse of many of the institutions which purported to train medical students, and the American Medical Association, backed by Dr. Abraham Flexner's report to the Carnegie Foundation, brought about a peaceful improvement so quickly and relatively so easily that its necessity was proved up to the hilt. After this progress went on apace: the Rockefeller Foundation put a number of the schools into good trim and in 1914 full-time academic professors of the clinical subjects were instituted at Johns Hopkins. Meanwhile, along lines less directly clinical, the Rockefeller Institute under Dr. Simon Flexner himself was pursuing its distinguished and productive career in adding to fundamental knowledge in medical science. Most important of all, and more difficult to describe and document, has been a complete change of atmosphere. What we miss in this interesting sketch is any appraisement of the changes in medical practice in which improvement has been as considerable as in the medical and near-medical sciences on which Dr. Flexner chiefly dwells. The particular eminence from which he has watched what was going on would not bring them into very clear view and it may be that he rightly assumes that if the foundation is sound the superstructure can be left to itself. But we cannot help feeling that he has in some degree overlooked the fact that the progress of medicine can ultimately be measured only in its capacity to prevent, alleviate, and cure disease.

INDUCING FITS FOR DIAGNOSIS

IN doubtful cases of epilepsy it may occasionally be justifiable to induce a fit for purposes of observation and diagnosis. Various methods of this "provocation diagnosis" have been tried. Hyperventilation may sometimes succeed; induced water-retention more often gives positive results. The administration of convulsant drugs is an obvious means of achieving the desired object, but would need very cautious use. Recently Duensing [1] has been experimenting with Cardiazol (pentamethylentetrazol, metrazol) and he reports that the rapid intravenous injection of 3 c.cm. of a 10 per cent. solution of this drug will induce a major fit in two out of three recognised cases of epilepsy. Those that fail to respond are not necessarily the cases with most infrequent fits. The induced fit is always generalised, even in patients who have previously only had localised attacks or psychic equivalents, and the method is therefore of no help in the observation of attacks due to local brain lesions. Further objections appear when the results of the similar administration of cardiazol to non-epileptics are studied. Half of a group of mental defectives gave a positive result, and it was found that their sensitiveness to cardiazol had no relation to the degree of defect; nor, more important, was the family history with regard to fits any different among those who reacted and among those who did not. A quarter of a group of people who were neither epileptic nor mentally deficient and who showed no sign of organic disease of the central nervous system had fits following a similar dose of cardiazol, and the same proportion of positive reactions was observed among schizophrenics. It

[1] Babcock, W. W., *Ann. clin. Med.* 1926, **4**, 933.
[2] Bennett, R. J., *Canad. med. Ass. J.* 1937, **36**, 134.
[3] *Science*, 1937, **85**, 505.

[1] Duensing, F., *Münch. med. Wschr.*, 1937, **84**, 1011.

will be remembered that induced cardiazol fits are being used in schizophrenia for therapeutic purposes.[2]

If we assume that a tendency to the convulsive form of reaction is inherent in the make-up of the central nervous system, it is tempting to regard a positive reaction to cardiazol as diagnostic of all the potential as well as the actual epileptics in the population. But, as Duensing points out, we should not be justified in doing this, for the presence or absence of a reaction is determined not only by the inherent tendency to convulsions of the individual but also by his sensitiveness to the particular drug used. It is, however, interesting to note that in the normal group the younger people, whose central nervous system is presumably less stable, show a higher proportion of positive results.

Duensing is not inclined to allow that the induction of fits has any undesirable after-effects. Vomiting is fairly often seen, and there may be complaint of headache or malaise the following day; while those who do not have fits may complain of giddiness or a feeling of fear. But even if no harm is done, the fact that there is no dose small enough to produce a fit in an epileptic which *may* not also cause a fit in a non-epileptic greatly detracts from the diagnostic value of this procedure. This objection does not apply to the induced water-retention method as described, for instance, by Clegg and Thorpe.[3]

OFFICIAL STATISTICS

EVERY year the Stationery Office issues innumerable volumes containing increasingly bigger and better statistics collected through official channels on most, if not every, subject under the sun. One may be interested in the special areas or the special constables, the mercantile marine or metalliferous mining, the health services, or the herring fisheries: some Government publication will contain the statistical information one requires. He who runs may read, but the question, in the face of this spate of material, is where to run to. The answer is to be found in that admirable vade mecum, the guide to current official statistics of the United Kingdom, the fifteenth annual volume of which has just been issued by the Permanent Consultative Committee on Official Statistics.[4] A few minutes with this publication will guide the faltering steps of the inquirers to all current official publications that contain statistics bearing on his subject, and, still more, will inform him of the nature of the statistics he will find in the volumes to which he is referred—i.e., their mode of analysis and the time and place to which they relate. For instance, if he is interested in small-pox the entries under this heading will reveal to him that from the Registrar-General's reports he can obtain statistics of cases and deaths for each week and quarter of the year in defined areas of the country; the Ministry of Health will tell him in one publication the cases notified on vessels and their port of destination, in another the number of vaccinations and conscientious objections in England and Wales; the health reports of the services will instruct him on its incidence in the Navy, Army, and Air Force; and so on. Or if he is more interested in smuggling the guide informs him that the twenty-seventh report of the Commissioners of H.M. Customs and Excise will afford him particulars of seizures, number and quantities, of persons convicted and the penalties recovered. No earnest seeker after statistical truth will grudge an annual shilling for this useful handbook.

[2] Finiefs, L. A., *Lancet*, July 17th, p. 131. Gillies, H., *Ibid*, p. 131.
[3] Clegg, J. L., and Thorpe, F. T., *Ibid*, 1935, **1**, 1381.
[4] Guide to Current Official Statistics. Vol. XV. 1936. H.M. Stationery Office. 1937. Pp. 404. 1*s*.

POST-TRAUMATIC SEQUELS OF HEAD INJURIES

THE lack of reliable information about the later course of cases of head injury was deplored by Prof. E. Mapother at the section of neurology and psychological medicine of the B.M.A. meeting at Belfast in July. It is some comfort, however, to learn that after examining the available evidence, he concludes that there has been no substantial rise in insanity corresponding to the greatly increased number of motor-car accidents in the last few years. Figures from Germany which suggest a rise in that country are not very convincing because mere scalp wounds are not differentiated from graver lesions. Any estimate is moreover complicated by the fact that many psychotics of mild degree remain at home, being sufficiently amenable not to require hospitalisation. Mental irritation developing after injuries to the head is, according to Prof. Mapother, of doubtful pathogenesis, but is important from the point of view of prognosis. The subsequent discussion turned partly on the relation of Korsakow's syndrome to cranial trauma. It was considered doubtful to what extent disturbances of outlook and volition could be attributed to accidents, whether sustained in motor-cars or in the boxing ring. Acute schizophrenia was said to arise commonly in the course of healing from damage caused by trauma; the sequelæ of such damage were closely related to the original lesion, in contrast with those of post-traumatic epilepsy. Dr. J. Purdon Martin detailed more precisely the psychological sequelæ. Dr. F. E. Pilkington, discussing treatment, deprecated the use of bromides, particularly in patients who had even mild arteriosclerosis, and cited examples of the consequences of giving them. He said that 60 per cent. of patients discharged apparently cured after these car accidents betrayed some symptoms of the smash years afterwards, and the prognosis given should thus not be unduly optimistic. The team guiding treatment should include surgeon, physician, and psychiatrist. The patient ordered prolonged rest must not be allowed to fancy himself neglected. Adequate sleep must be secured, if necessary by hypnotics, and reassurance was of course helpful. The fear of going mad was not uncommon. Compensation hysteria seemed to be becoming more common; it was best treated by a final lump-sum settlement, but this was only possible after the diagnosis was definite and not likely to require revision. Dr. C. E. Winterstein contributed an exposition of the effects of punishment on boxers, which we publish on another page. Dr. W. Ritchie Russell held that more attention should be paid to the jarring of the brain; elderly patients stood this badly, though they might minimise at first the immediate results of a car accident. Young children, who had just learned how to talk, might lose six months of their apparent intellectual age after such accidents, and this should be taken into account when reassuring their parents. Dr. J. Thompson of Belfast thought that many post-traumatic symptoms might be ascribed to interference of the blood-supply to the cerebral cells. Another point raised was that any such shock to the brain interfered with consciousness at one level or another. This was a transitory phenomenon, and was not as a rule dependent on the degree of physical damage sustained. The possibility that some biochemical change was

produced, as in myotonia, was mooted. Phobias after accidents were said to be usually amenable to treatment by persuasion; if such phobias are neglected, serious and intractable personality traits may supervene. In this discussion organic neurologists and psychiatrists met on common ground and their several contributions seemed to interlock in a way unusually helpful to both.

MEDICINE IN CHINA

THE latest report of the National Quarantine Service of China [1] makes sad reading at the present time. We are accustomed to find in these reports not only records of the work done at each of the six quarantine stations but addresses and original articles of considerable value. This number of the series lives up to its reputation with papers by the editor, Wu Lien-teh, an account of modern trends in plague work by the senior quarantine officer (C. Y. Wu), a well-documented description of Chinese emigration by F. S. Wong, and a discussion of air temperature and humidity in relation to health by J. W. H. Chun. Once largely a European organisation, the Quarantine Service is now run by the Chinese, with some Western help during the transition period, notably from the Health Section of the League of Nations. Having little to boast about in their relations with China, the Western Powers may well point with pride to the Quarantine Service, since Western medicine is one of the few blessings which our civilisation has brought to China. So far as prevention is concerned, however, this is once more threatened, as witness the epidemics of cholera reported from Hong-Kong and Shanghai. Meanwhile the missionary societies, with their many hospitals, are striving to increase and strengthen their personnel and equipment so that the forces of curative medicine at least shall be employed to the best advantage. The need and the opportunity are evident from the letters we publish on p. 709.

GONADOTROPIC SUBSTANCES IN ACNE AND ALOPECIA

Now that belief in sepsis—focal, local, and general—as a cause of unexplained diseases is on the decline, attention is being focused on the internal secretions. The cure of the obscure is sought in the injection not so much of vaccines as of gland substances. Acne, with its conspicuous relation to puberty, pregnancy, and the menopause, has early qualified for endocrinological attack. Bombarded with dead bacilli, it has swept round the orbit of vaccine therapy for a quarter of a century—latterly bathed in rays both visible and invisible. And now we see it starting on a new cycle, this time to the tune of the "endocrine orchestra." Will it meet an all-illuminating comet? Or will it come back again in 25 years' time exactly as it is now leaving us?

Acne and alopecia bear not the faintest resemblance to one another, nor are they often associated. It seems therefore improbable that exactly the same treatment should cure them both. Yet such is Pighini's claim.[2] Injections of anterior pituitary body, he says, can cure acne, alopecia, and also rosacea. The number of cases he reports are not many—a great deal fewer than the injections required for the cure of any one of them. He gave 11 patients with alopecia, 4 with acne, and 1 with rosacea intramuscular injections of anterior pituitary extract, combined with local treatment, and of these 10 are stated to have been cured. It is difficult, however, to exclude the effects of the local applications and so far as acne is concerned more credence will be placed in the results of Williams and Nomland,[3] who had not only a group of patients receiving a gonadotropic factor from pregnancy urine but also a control group receiving sterile water. Both groups—39 in all—had also intensive local treatment with lotions, compresses, and expression of the comedones, and when it came to weighing the improvement the difference between them proved insignificant. Nevertheless McCarthy and Hunter,[4] with hormone tests, found that about 40 per cent. of males with acne, and 80 per cent. of females, had pituitary or gonadal dysfunction, and it is interesting to note that in Williams and Nomland's series menstruation became regular in all the women receiving the hormone who had previously complained of irregularity, and in half the controls.

POST-MORTEM ROOMS AT HOME AND ABROAD

WHY are pathologists, in particular morbid anatomists, so little fastidious about the places in which they work? To many detached observers some of our hospital post-mortem rooms must seem almost on a par with the operating-theatres of pre-Listerian days in the disregard of ordinary standards of facilities for cleanliness. The conception of asepsis revolutionised the conduct of surgical operations because the interests of the patient demanded this reform. The conduct of autopsies has not followed suit because the subject is beyond damage and only æsthetic considerations arise. Even if these are deemed relatively unimportant there are grounds for improving the equipment of post-mortem rooms in many of our teaching hospitals. Convenience demands that pathological departments shall not be far from the wards, and students should be encouraged to attend post-mortem examinations and demonstrations. Here they gather round the corpse, examine the organs, usually with ungloved hands, which later receive a more or less adequate wash. They may sometimes touch the dead bodies with the edges of their sleeves, and other parts of their clothing may be accidentally splashed. A student who escapes such gross contaminations may yet get his hands bacteriologically soiled through contact with door-handles and parts of furniture that dirtier hands have touched. It is for this reason that many obstetricians and surgeons, mindful of Semelweis, forbid their dressers to attend autopsies. A better solution might be found in a fuller protection of the student. In the beautiful new institute built at the Sabbatsbergs Sjukhus in Stockholm for Prof. Bergstrand an anteroom is provided for the student who removes his coat and puts on a white gown and rubber gloves before entering the post-mortem room; before leaving it he washes his gloved hands, removes the gloves, returns to the anteroom to take off the gown, washes his hands again before putting on his coat and goes away clean. So much for students; but what of flies? Even recently built post-mortem rooms are seldom so constructed as to prevent their free access to cases perhaps of enteric fever, septicæmia, pneumonia, and so forth. Who knows where they go afterwards? One could conjecture unlimited opportunities for the spread of disease by their agency. In America precautions

[1] Reports of the National Quarantine Service. Series VII, 1937. Shanghai. 2 dollars U.S.

[2] Pighini, G., *Policlinico*, 1937, **24**, 1924.

[3] Williams, G. E., and Nomland, R., *J. Amer. med. Ass.* August 21st, p. 564.

[4] McCarthy, L., and Hunter, L., *Arch. Derm. Syph. N.Y.* 1937, **35**, 211 (quoted by Williams and Nomland).

against flies are ubiquitous and windows and doors are protected with gauze screens as a matter of course. Is it not time that we adopted this simple device? By a close collaboration between pathologist and architect the happiest results could be achieved. The last few years have seen the erection of many fine buildings to house pathological departments other than those attached to teaching schools, and more are contemplated. Some of them are institutes designed by and for an individual teacher and his disciples: of this kind of institute it has been said wickedly that the proud director spends the rest of his days showing it to visitors. Others are the outcome of municipal activity in improving hospital equipment, where there is sometimes a tendency to build over-lavishly. Perhaps the greatest need, however, to which we have often called attention, is decent provision throughout the country for the performance of autopsies ordered by coroners. The post-mortem rooms of some of the most modern mortuaries are not fly-proof but are in other respects satisfactory; no one who has not witnessed the disgusting conditions under which the work has to be done in many districts could believe that the tales told of them are not exaggerated.

THE STRANGEWAYS RESEARCH LABORATORY REPORT FOR 1936

THE Strangeways Research Laboratory, Cambridge, under the direction of Miss Honor Fell, D.Sc., has acquired deserved repute as a centre not only for the study of methods of cultivating living tissues, but for the application of these methods to fundamental problems of biology. During 1936, according to its annual report, the laboratory has accommodated some 22 research workers, as well as providing instruction in the methods of tissue culture to many others. The work falls into two main divisions. One is concerned with the growth and development of cells and tissues and their organisation in embryonic development. The other relates to the action of radiation on living cells. Valuable work has been done by in-vitro cultivation of mammalian and avian embryos and tissues; on organiser phenomenon; on histochemical changes during development; on bone, teeth, and blood-vessel formation, and on the factors influencing these. Mammalian gonads have for the first time been successfully cultivated, and important information should now be obtainable on the influence of various factors upon germ-cell development. The effects of carcinogenetic agents and of parasitic fungi upon cells in vitro are also being investigated. Physiological studies of the action of ions on the embryonic heart has led to some interesting results. The radiological work deals mainly with the control of cell division by irradiation. The effects of single exposures to gamma rays on embryonic mammalian eye have been observed. Material examined six hours or more after exposure showed a wave of increased mitosis followed by a peak value of degeneration. Earlier examinations showed that it was not possible to predict the exact type of response. Work on the effect of gamma rays on tadpole tissue showed that, with the doses used, degenerate cells were only produced when mitosis was active in the irradiated tissue. With divided doses the efficiency was determined chiefly by the interval between exposures. The biological significance of a change of filtration of a gamma ray beam has also been examined, and bacteria have been exposed to the action of gamma rays.

At present the laboratory depends almost entirely for its maintenance on grants and on the generosity of private persons. It is essential for the work in progress that there should be a greater sense of security; the trustees urge the need of an assured income for the laboratory and make an earnest appeal for funds for this purpose. It is very much to be hoped that the director, Dr. Honor B. Fell, and her staff will receive the necessary support.

AN INTERNATIONAL PHARMACOPŒIA ?

PROJECTS for the preparation of an international pharmacopœia have been discussed for more than sixty years. As long ago as 1874 an unsuccessful attempt was made to compile one on the basis of the then current French Codex; eleven years later, in 1885, a draft of an international pharmacopœia was placed before an International Pharmaceutical Congress held in Brussels. Nothing came of it; the only full record is the Latin text, published in the official organ of the Pharmaceutical Society in that year. Since then efforts to bring about international uniformity have been less ambitious, attention having been concentrated on the more potent drugs, but unfortunately no results of any consequence have been attained, and the position is much the same as that described by Dr. C. H. Hampshire, secretary of the British Pharmacopœia Commission, in his address as chairman of the British Pharmaceutical Conference in 1934, which was commented on in THE LANCET at the time. At the tenth general assembly of the International Pharmaceutical Federation held in Copenhagen at the end of August last, it was resolved that a committee of seven, drawn from different countries, should be set up for preparing a pharmacopœia; but while small committees may work more quickly than big ones, sixty years represents a lot of leeway to make up. Something may happen much sooner than the International Pharmaceutical Federation suspects; other bodies have been at work and if the League of Nations makes a definite move in this matter before many weeks are passed, the Federation's committee will be saved work and anxiety. Whatever the appropriate department of the League may do, however, it should not be forgotten that the ploughing and the seeding have been done by the International Pharmaceutical Federation.

ADDRESSING representatives of the Welsh local authorities at Cardiff on Sept. 9th, Sir Kingsley Wood, the Minister of Health, said he hoped early in the new session to introduce in the House of Commons two important measures, one to reduce the age-limit for the award of pensions to the blind and the other to provide medical care for young persons who had left school.

AN International Congress of Obstetrics and Gynæcology will be held in Amsterdam from May 4th to 8th, under the presidency of Prof. A. H. M. J. Van Rooy. The main subjects for discussion will be eclampsia, thrombosis and embolism, and hormones, and those taking part will include Dr. E. Klaften (Vienna), Dr. H. Vignes (Paris), Prof. B. Stroganoff (Leningrad), Prof. K. de Snoo (Utrecht), Prof. R. Remmelts (Batavia), Prof. E. Alfieri (Milan), Prof. D. Dougal (Manchester), Prof. S. E. Wichman (Helsingfors), Prof. G. Wagner and Prof. C. Kaufmann (Berlin), Prof. C. Hartman (Baltimore), and Prof. L. Brouha (Liége). The secretary of the congress is Dr. F. C. Van Tongeren. The last International Congress was held in Berlin in 1912.

SPECIAL ARTICLES

WHEN IS CAPILLARY FRAGILITY A SIGN OF VITAMIN-C SUBNUTRITION IN MAN?

By Gustaf F. Göthlin, M.D.
Professor in physiology at Uppsala University, Sweden

By dietary experiment on a man and a woman whose capillary resistances to rupture were initially normal I was able to show that subsistence on a diet extremely poor in vitamin C gradually gives rise to capillary fragility (Göthlin 1931). The change proved to be reversible, for with increasing doses of fresh orange juice the strength of the cutaneous capillaries slowly returned to normal.

On these and other observations I based a method of ascertaining indirectly whether a person's supply of vitamin C is sufficient. From the very first, however, I was fully conscious that, in disease, the capillaries may become fragile from causes other than a deficiency of vitamin C, and in consequence I was also aware that the test should be used mainly for *healthy* persons. This attitude found expression in the title of my first publication (1931): "A method of establishing the vitamin-C standard and requirements of physically healthy individuals by testing the strength of their cutaneous capillaries." With regard to persons suffering from digestive affections, Öhnell (1928), using the so-called Hess's capillary test, had previously taken a large number of petechiæ as an indication of latent scurvy.

DEVELOPMENT OF THE CAPILLARY TEST

Since 1931 the use of the capillary test has developed. I must make it clear, however, that this paper does not attempt to answer criticisms directed against capillary methods other than the one I have worked out, and especially not the criticisms (Hawley, Stephenson, and Anderson 1936, Abt, Farmer, and Epstein 1936) directed against the so-called suction test (Hecht 1907, Borbély 1930, Dalldorf 1933). The basis of the over-pressure procedure is clear and unassailable, but this can by no means be said of the suction procedure.

A statistical investigation of my capillary test, carried out in 1933 by Geschwind and Rundqvist (1935), has been published under the title: "Tests carried out on 200 persons with Göthlin's method for determining the strength of the skin capillaries, and statistical treatment of the results." Their observations led to certain changes in the procedure I had described (1931 to 1933) which was intended in the first place for mass investigations. The statistical investigation comprised observations on 200 persons, whose right and left arms were examined with the 35 mm. as well as the 50 mm. test. The results led me, from the beginning of 1935, wherever possible, to make all *individual* determinations on both arms and proceed from the mean figure of the results on both arms.

Outside Sweden very little attention has been paid to my suggestion that, in cases where the strength of the capillaries is suspected of being subnormal, the stasis test ought to be made with the 35 mm. over-pressure also. Experience in recent years, however, has shown the necessity of making both the tests in individual doubtful cases, for occasionally the 35 mm. test changes the result from "normal" to "abnormal." When the test is made with both these pressures, the determination with 35 mm. over-pressure must, of course, precede the one with 50 mm. over-pressure. Nevertheless, certain circumstances argue against making the second test immediately after the first. In a series of plethysmographic observations by Fänge (1934) on six students, it proved that the return to normal volume in the forearm after a test with 35 mm. over-pressure, as directed, might take as long as 37 minutes. It will probably be unwise to make a fresh over-pressure test while the vasomotor effects of a previous one remain. To be sure of the return to vasomotor equilibrium, I therefore decided not to make the test with 50 mm. over-pressure until at least an hour after the over-pressure test with 35 mm.

In accordance with what has been said above, an individual double-arm test resolves itself into the following systematic procedure.*

The person to be tested either sits with both arms loosely extended at the elbow-joints, supported in such a way that the folds of the elbows are on a level with the heart (third rib), or lies on his back with his arms stretched out loosely on the supporting bed. To a 5-branched star-shaped piece of metal tubing runs a tube from an air-pressure pump (for filling the system with air) fitted with a screw clamp, a tube to a Politzer's balloon contained in a compressor (for exact regulation of the pressure), two tubes to the cuffs for the two arms, and finally a tube to the manometer. A first double-arm test is made with 35 mm. over-pressure and later—not within an hour—a fresh double-arm test with 50 mm. over-pressure. Immediately before the treatment with 50 mm. over-pressure an examination is made to see whether any more petechiæ have appeared during the interval, which is not uncommon. In all readings the prescribed 5-dioptre lens must be used, otherwise a number of petechiæ will be overlooked. A lens of more than 5 dioptres must not be used, for with it more petechiæ are discovered (Billing 1935). If lenses of more or less than 5 dioptres are used my principles for judging the results cannot be applied. It is also necessary that the investigator should have full acuity of vision (10/10), and that the investigation should be made in full daylight or equivalent artificial light ("daylight" lamp).

A numerical index of the petechiæ counted is drawn up on the following principles. More importance as an indicator of fragility must be ascribed to a petechia after the lower over-pressure of 35 mm. than to one which does not appear until after the higher over-pressure of 50 mm. Accordingly, as an approximation, every petechia which appears only with 50 mm. over-pressure is counted as 1, whereas every petechia appearing with 35 mm. over-pressure is counted double. By adding together the number of petechiæ which appear within the delimited circular areas with a 6 cm. diameter within the folds of both elbows when the 50 mm. over-pressure is applied, and twice the number of petechiæ within the same areas with 35 mm. over-pressure, a *double-sided petechial index* is obtained, which is an expression of the fragility of the cutaneous capillaries at the time of investigation. If the investigation has to be limited to one arm only—for example, if it will have to be renewed within three weeks—a *one-sided petechial index* may be drawn up on the same principles.

My earlier work indicates that the borderline between capillary fragility and a normal (or nearly normal) strength of the cutaneous capillaries lies approximately at the double-sided petechial index 12—i.e., the values that exceed 12 are to be regarded

* A complete apparatus can be obtained from Kirurgiska Instrument-Fabriks A.-B., Stockholm.

as indicating capillary fragility. In reality a subnormal strength of the capillaries cannot be excluded with certainty with the values 9–12 (borderline cases). I now have reason not to insist on my earlier (1931) suggestion of two grades—III and IV—of insufficient capillary strength, but instead combine them into one category, a grade III of capillary strength which includes all degrees of undoubted capillary fragility. According to earlier statements, the borderline for one-sided petechial indexes lies approximately between 8 and 9—i.e., values above 8 are to be looked upon as indicating capillary fragility. Even with the borderline values 5–8 a subnormal strength of the capillaries cannot, however, be excluded.

TESTS OF THE METHOD

The accuracy of this method of estimating the sufficiency or insufficiency of the supply of vitamin C can of course be checked; but before the production of ascorbic acid in pure form, this checking took a long time. Earlier I had convinced myself that the vessel fragility I observed in school-children was due to a deficiency of vitamin C because I found that it disappeared when the children had fresh oranges for several weeks. But to recommend such a time-consuming procedure to those who might employ the method was almost useless, and I did not do so. Nowadays, when vitamin C is an article of commerce and concentrated (even heroic) doses have become possible, the checking procedure can be much improved and shortened.

The honour both of being the first to realise actual short-time control of the capillary test and of being the first to inject ascorbic acid intravenously falls to Schultzer (1933). Into a patient with scurvy, whose capillary condition was characterised by 20 petechiæ on one arm with 50 mm. over-pressure, he injected doses of ascorbic acid, each of 40 mg., intravenously. After fifteen such injections within twenty days, the capillary reaction had changed to normal—viz., 4 petechiæ—with the same over-pressure, and at the same time the scorbutic symptoms had greatly improved. In a later paper (1936), in which an account is given of a more intensive ascorbic-acid treatment of three scorbutic patients, Schultzer writes: "The clinical effect of the ascorbic acid, including the effect on the capillary resistance, appeared long before the patients were saturated."

Many people whose vitamin-C supply is to be tested will find it irksome to submit to several intravenous injections, and I therefore think it preferable as a rule to give the ascorbic acid by mouth even though the effect is slower. At my suggestion G. Andersson has made some tests of this kind at the Ullerâker Mental Hospital on patients regarded as physically healthy. A dose of 300 mg. ascorbic acid was given daily, dissolved in a small glass of water, with sugar. Usually half the dose was taken in the morning and half in the afternoon. From these investigations, which are still unpublished, Andersson obtained, inter alia, the following results:—

H. P. Woman aged 43. First examination on Jan. 13th, 1937, left arm, gave the result $35_8 + 50_7$—i.e., one-sided petechial index = 23. From Jan. 15th to 19th inclusive (5 days) she received ascorbic acid 300 mg. daily, and a second examination on Jan. 20th gave the result $35_1 + 50_2$ on the right arm—i.e., petechial index = 4.

I. T. Man aged 41. First examination on Jan. 27th, right arm, gave the result $35_{10} + 50_4$—i.e., one-sided petechial index = 24. Treated with 300 mg. ascorbic acid daily from Feb. 2nd to 5th inclusive. Second examination on Feb. 6th, left arm, gave the result $35_2 + 50_6$—i.e., one-sided petechial index = 10.

E. G. Man aged 39. First examination on Feb. 5th, left arm, gave the result $35_{23} + 50_{19}$—i.e., one-sided petechial index = 65. From Feb. 6th to 11th inclusive (6 days) he received 300 mg. ascorbic acid daily. Second examination on Feb. 12th, right arm, gave the result $35_9 + 50_{21}$, which corresponds to a one-sided petechial index of 39.

O. B. Woman aged 42. First examination on Feb. 9th, left arm, gave the result $35_{14} + 50_8$—i.e., one-sided petechial index = 36. From Feb. 11th to 15th inclusive (5 days) she received 300 mg. ascorbic acid daily. Second examination on Feb. 16th, right arm, gave the result $35_0 \times 50_{10}$—i.e., petechial index = 10.

According to these and other observations, six days' medication with 300 mg. ascorbic acid daily suffices for the desired control, and should lead to a decrease of at least 30 per cent. in the petechial index in cases where a deficiency of ascorbic acid is the chief cause of the capillary fragility. If the petechial index does not fall after such a test it is unlikely that a deficiency of ascorbic acid has played any essential part in causing the fragility.

Where as in this test it is necessary to repeat the observation after so short a time as six days, the test must be made the first time on one arm and the second time on the other—i.e., one must determine a *one-sided* petechial index.

Commercial production of the pure vitamin (ascorbic acid) has extended the field of usefulness of the capillary test. Apart from the diseases previously (1932, 1933) mentioned by me (uncomplicated arteriosclerosis, afebrile tuberculosis, uncomplicated afebrile gastric ulcer, uncomplicated achylia), the sufferers from certain other chronic complaints—e.g., chronic afebrile nervous diseases, chronic afebrile rheumatic diseases, provided that they are not treated with drugs that are capillary poisons—could be examined for their vitamin-C supply by the method described above. As I have no clinical hospital material at my disposal, however, I cannot express an opinion based on my own experience.

In common with Harris and Ray's (1935) method, which uses urinary excretion as a means of estimating the saturation of the body with ascorbic acid, the control method described above has two advantages. In both methods recourse to venous puncture is avoided, and if the test confirms the suspicion of a deficiency of ascorbic acid the treatment has already been begun with the investigation procedure. The capillary test has the advantage that it does not involve the laborious preservation and immediate acidifying of each urine discharge during the days that elapse before saturation is reached. The saturation procedure has the advantage that it reacts to less pronounced C-deficiency, and that, in the hands of an experienced investigator, it gives more finely graded results.

THE DEGREE OF VITAMIN-C SUBNUTRITION DETECTABLE BY THE CAPILLARY TEST

Before the chemical constitution of vitamin C was discovered, and before the pure substance became commercially available, the capillary method was the only one that afforded any indication of the supply of vitamin C in a person who was not suffering from scurvy. Certainly the information which it could give was—and still is—fairly limited. I would express the possibilities thus: if a healthy person shows subnormal strength of the capillaries, this is evidence of a subnormal supply of vitamin C; but if a person has normal strength of the capillaries, his indispensable requirements of ascorbic acid are satisfied. I have not assumed that a person with fewer petechiæ should be considered better supplied

with vitamin C than another with more petechiæ, when both the petechial indexes are below the border value. But I have assumed that if in one and the same person the number of petechiæ for the same pressure treatment diminishes to a significant extent, this diminution is evidence of increase in his supply of vitamin.

The direct determinations of ascorbic acid in the blood has now made it possible to throw light on the borderline between a vitamin-C supply that satisfies the vitamin-C requirements of the capillaries and one that does not. Parallel with determinations of the ascorbic-acid content of the blood, in accordance with Emmery and van Eekelen's (1936) method, Deggeller (1936) has made determinations by my capillary method on a number of hospital patients. Similar parallel determinations have also been made in a prolonged experiment on himself, with abstinence from ascorbic acid, by van Eekelen (1936). Provided that—as I presume—these authors' capillary tests were made according to the prescribed rules, and provided that their reduction values in the blood, found by titration, correctly represent its ascorbic-acid content, it appears that the border value of ascorbic acid in the blood which corresponds to the borderline between normal and subnormal strength of the capillaries must be below 1·4 mg. per litre of blood and be of the order of magnitude of about 1 mg. per litre. For such blood values as 4, 3, 2, and 1·5 mg. ascorbic acid per litre—all of which are characterised by Deggeller as insufficient—the capillary test would thus give no reaction. In countries where (as appears to be the case in Holland, a land of gardens) figures as low as 1 mg. ascorbic acid per litre of blood are hardly met with, there will be very little use for the capillary test. But there are other countries where the position is quite different. At least, judging from my own results and those of my co-workers, there are in Sweden thousands of individuals who, without suffering from demonstrable illnesses, develop capillary fragility during the late winter because of an insufficient supply of vitamin C. In such countries it is necessary to deal first with the severe deficiencies and to leave the slighter ones to be dealt with later, and for this reason the capillary test is of considerable value. Moreover, I cannot think it justifiable, merely from estimates of the ascorbic-acid content of the blood of the healthy population of a certain small area of the world, to decree where the borderline for man in general lies between a sufficient supply of ascorbic acid and an insufficient supply. To make such an assumption would be to proceed in much the same spirit as was shown when, from the well-known determination by C. Voit that the "average German workman" consumed 118 grammes of protein per 24 hours, the conclusion was drawn that a daily consumption below 118 g. was insufficient.

Even though the Dutch statistics show that vitamin-C concentrations in the blood as low as 5–2 mg. per litre are unusual in Holland, this is in itself no proof that they are inadequate. It is the human organism itself that will show when the supply of a requisite substance is insufficient.

SUMMARY

For the reasons given above I believe that the method I described for determining the resistance to rupture of the cutaneous capillaries can still be used advantageously in cases where there are no resources for making ascorbic-acid determinations in the blood, or when the person to be examined will not permit puncture of a vein. It should be understood, however, that only in healthy persons does a single capillary test give information about the individual's intake of vitamin C. If the test is made on a person with a chronic disease—I am excluding diseases which themselves give rise to capillary damage, and illnesses treated with drugs capable of doing so—or if it is made in a case where it is doubtful whether the person is healthy, it is necessary to have a second observation after doses of ascorbic acid, and the following procedure will be appropriate.

The capillary test is made on one arm only,† and the result calculated in the form of a petechial index as explained above. If this test shows capillary fragility 300 mg. ascorbic acid is given by mouth daily for six days. On the seventh day the capillary test is made on the other arm † and the petechial index is calculated. A fall of 30 per cent. or more in the petechial index between the first and the second examinations proves that a subnormal supply of vitamin C played a considerable part in causing the capillary fragility.

Acute illnesses which by giving rise to toxins affect the capillaries' resistance to rupture, capillary poisons —e.g., histamine, arsphenamine—and skin diseases localised in the arms, make it impossible to draw any conclusions about the supply of vitamin C from the results of my capillary test.

Judging from parallel determinations made by Deggeller and by van Eekelen, with my capillary method and with estimates of the ascorbic-acid content of the blood, my method does not reveal capillary fragility due to a subnormal supply of vitamin C until the ascorbic-acid content of the blood (Emmery and van Eekelen's method) is about 1 mg. per litre of blood or less.

In *mass investigations*, when it is desired to ascertain whether the requisite quantities of ascorbic acid are present in the regular dietary—e.g., in mental hospitals, charitable institutions, prisons, sanatoria, and regimental barracks—the capillary method is one that for practical reasons should still be considered. It is probable that a simultaneous double-arm test, with the 50 mm. over-pressure only, will here be as effective as, and take less time than, the procedure originally proposed (1931–33)—i.e., the one-arm test at 50 mm. over-pressure on one arm, and subsequent one-arm tests on the "borderline cases," with 35 mm. over-pressure on the other arm.

If it is desired to obtain information by means of mass investigations upon school-children, coming from homes with varying vitamin-C supplies, as to the variations in this respect in the different homes, the test will have to be made according to the procedure described for individual examinations with two double-arm tests (one with 35 mm. and a later one with 50 mm. over-pressure).

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† Note that petechiæ may develop after blood-pressure determinations with a cuff on the upper arm, and that these may remain for several days.

SHORT WAVES AND SHORT-WAVE THERAPY

THE CONGRESS IN RETROSPECT *

THE scope of the International Short-Wave Congress was a very broad one. There were papers on all aspects of the subject: production, transmission, and reception of short waves; absorption by chemical and biological systems; the distribution of heating in heterogeneous bodies; "specific" physical, chemical, and biological effects; and therapeutic applications. While it is clearly impossible for any one person to be fully acquainted with all these branches, it is also certain that there were very few papers presented, even among the purely physical ones, that could legitimately be ignored by the medical man. It was indeed one of the objects of the congress, as Prof. THIRRING emphasised in his address during the opening ceremony, to enable some of the fundamental medical questions—mode of action of short waves, measurement of "dosage" in short-wave therapy—to be discussed at joint sessions of the medical, physical, and biological sections. The discussion has not, perhaps, brought us very much nearer to a solution of either of these problems; but it will have been invaluable if it has only helped a few short-wave physicists to think biologically, and a few short-wave practitioners to understand the value and the limitations of a purely physical consideration of their problems.

PRODUCTION AND APPLICATION OF DECIMETRE WAVES

The interest of the papers on the production of short waves, from the medical point of view, lies in the fact that they dealt predominantly with centimetre and decimetre waves. The significance of this is clear enough: these very short waves are becoming of increasing commercial value, and resources are being used for their investigation which would never be available for any purely medical purpose. It is however inevitable that as soon as they can be produced at sufficiently high intensity these waves will be used therapeutically, and it is important that the new difficulties which their use will involve should be anticipated before they are widely and irresponsibly applied. Preliminary papers on the therapeutic effects of 80 cm. waves were indeed presented at the congress by BRÜNNER-ORNSTEIN (Vienna) and DÉNIER (La Tour-du-Pin).

With the use of higher frequencies, the condenser-field method will become less important and will be replaced by a quasi-optical technique—true "irradiation," in which the properties of the tissue irradiated will be more conveniently expressed by its refractive index and optical absorption coefficient than by its conductivity and dielectric constant. The possibilities of such methods are being worked out by PÄTZOLD, of the Siemens's research laboratories, Erlangen. Pätzold has measured the *Halbwertsschicht* for various salt solutions—that is, the depth of solution which is sufficient to reduce the intensity of an incident ray to half its initial value—at a wave-length of 430 cm., finding values of 1·9–20 cm. for the conductivity range 10^{-2}–10^{-4} ohm.$^{-1}$ cm.$^{-1}$, and is making further measurements at λ85 cm. Such measurements are of the greatest importance, since the values of refractive index and absorption coefficient (or dielectric constant and conductivity—the constants determining heat-production) measured at longer wave-lengths are no longer valid—partly because of the increasing conductivity of water as the frequency is increased. New absorption measurements on water, mentioned by FALKENHAGEN and by ESAU, show that the maximum absorption coefficient occurs at a wave-length of about 2 cm.

SELECTIVE HEATING

At the wave-lengths at present in general use, the factors determining distribution of heat in tissues have long been understood theoretically, but the matter is in practice so complex that the proper choice of wave-length for selective heating of a certain region, and the rough estimation of the degree of selectivity, have hitherto been impossible; clinical procedure has necessarily been empirical, and it is only recently that reliable values of the relevant constants for different tissues have been obtained. It is a result of the cellular structure of tissues that at very low frequencies they have high apparent dielectric constants and comparatively low conductivities; at higher frequencies, the conductivity increases and the dielectric constant decreases, the manner in which this transition occurs depending on the type and even on the physiological condition of the tissue. RAJEWSKY (Frankfurt a. M.) reported measurements of the conductivity of a number of tissues at different wave-lengths, while OSSWALD (Erlangen) determined both conductivity and dielectric constant, and pointed out that for any reliable calculation of the most suitable wave-length for selective heating of a given tissue, complete data of this type—"dispersion curves" for all the tissues concerned—must be available. Osswald draws the important conclusion from his new data, that for the greatest possible reduction of heating of fat and the greatest selective heating of muscle, the following two conditions must be chosen: (1) the field must be made as homogeneous as possible by the use of a wide gap between electrodes and skin, and (2) the shortest available wave-length—1 m. or less—must be used. In general a selective heating of other tissues, excluding fat, will hardly be possible, but it should be possible when very short waves are available—e.g., about 40 cm.—to heat the pure body fluids (bile, urine, &c.) without any considerable heating of the neighbouring tissues.

The relative decrease in the heating of fat at shorter wave-lengths, predicted from Osswald's results, has actually been observed by PÄTZOLD, ESAU, and AHRENS, who measured the rise of temperature of layers of muscle and fat placed in series in the condenser field. At λ6 m., the fat was heated more, and at 1 m. less, than the muscle.

SPECIFIC (NON-THERMAL) EFFECTS

On the scientific side, it cannot be said that any particularly significant new experimental data on non-thermal effects were presented; a number of papers dealt with the effects of the condenser field on bacteria, moulds, viruses, &c., and the best of these from an experimental point of view—to express a personal opinion—reported monotonously negative results. Nevertheless a certain theoretical clarity was introduced in the paper of KRASNY-ERGEN, who described the specific mechanical and electrical effects of the alternating or rotating electric field on heterogeneous systems—effects which would not, however, be sharply frequency-specific, and which do not provide any starting-point for a theory of specific *chemical* effects. Such a theory would indeed be superfluous until satisfactory experimental evidence for a chemical action of the condenser field has been produced. In an interesting paper, KÖNIGER (Brno)

* The first International Congress for Short Waves in Physics, Biology, and Medicine was held in Vienna in July. A report from our Vienna correspondent appeared in THE LANCET of August 14th.

discussed the types of chemical reaction system which might be used in a search for such effects.

TREATMENT

"Low Intensity" Therapy.—Meanwhile, the therapeutic effects of exceedingly low intensities of ultra-high frequency energy continue to be investigated, above all by LIEBESNY (Vienna; administrative president of the medical section of the Congress), who described the favourable effects of "athermal" treatment on furuncles, carbuncles, lung abscesses, and certain tuberculous lesions; MELLER, LÖWY, and FUCHS obtained equally satisfactory results in the treatment of inflammations of the middle ear, and HAUSMANN, RIEGER, and RABINOWITSCH described the results obtained in the Viennese ophthalmological clinics.

The question of the relative effectiveness of large and small intensities in different pathological conditions arose very frequently during the medical sessions. MEYER (Paris) advocated the use of very small doses in treatment of angina pectoris, and emphasised the necessity for a very careful clinical selection of cases, although SIEGEN (Bad Kudowa), who also reported excellent results in various forms of angina, apparently used rather high intensities. URBACH (Prague) claimed to have confirmed the value of Liebesny's methods for a large number of acute inflammatory states, with a few exceptions, while emphasising that chronic conditions, especially those which in general react favourably to other forms of heat treatment, require larger (thermal) doses. Several contributors to the discussion following KORB's (Erlangen) paper on the technique of gynæcological short-wave therapy—RICHTER, SCHOLTZ, RIEMER, ROTHWIEN, WOLF—agreed on the value of very small doses in acute inflammatory conditions, and of larger doses in chronic cases; indeed the same opinion was repeatedly expressed in other papers.

The Problem of Dosage Measurement.—The question of "athermal" treatment suggests immediately the problem of dosage: on what grounds do the advocates of weak dosage assert that the temperature rise in the patient is negligible? The usual criterion of dosage is a subjective one, and LIEBESNY himself pointed to its extreme unreliability. A chronic arthritic, for example, was repeatedly given a dose which led to a rise of 3°–4° C. in skin temperature, without his experiencing any sensation of warmth, and in other cases a rise of as much as 8° C. was accompanied only by a "pleasant" warmth. The rapid objective measurement of dosage is, however, very difficult, and most of the new methods suggested at the Congress are open to some objection, or are too complicated for general use. WENK (Erlangen) described a method, accurate to 5 per cent., in which the resonance curve of the patient's circuit is imitated in a substituted circuit consisting of condensers and fixed resistance, the loss of energy in the resistance being then read off directly in watts. The description of a second method, more rapid but less accurate (15 per cent.), lacks essential details. MITTELMANN (Vienna) measures the current passing during treatment with a thermocross, and the effective resistance of the circuit with a secondary transmitter and valve voltmeter. SCHWARZ suggests that for measurement of the true voltage across the patient, small electrometer electrodes might be mounted in the condenser plates.

Short-wave Therapy in General.—SCHLIEPHAKE, in his admirably restrained introductory paper, emphasised the dangers of "automatic" use of short-wave therapy in the hands of sisters and bath supervisors; he then mentioned the comparatively restricted pathological fields in which it has become definitely established as a therapeutic agency:

(1) Pyogenic skin inflammations, empyema of the accessory nasal cavities, pleurisy, and lung abscesses. The correct dosage, still entirely a matter of guesswork, is essential, over-dosage being dangerous and under-dosage ineffective. The dosage can be gradually increased during the course of treatment.

(2) Various ophthalmological conditions, such as inflammation of lacrymal duct, iritis, and retrobulbar neuritis.

(3) Chronic rheumatic arthritis. Here general treatment with large doses is usually necessary; the improvement is often considerably delayed, perhaps for several weeks after treatment has been stopped. The most severe cases of polyarthritis may show astonishing improvement.

The treatment of circulatory disturbances, including intermittent claudication, frost-bite, and thrombo-angiitis obliterans, was several times referred to, somewhat uncritically, and WOLF (New York) pointed out that a heat therapy would only be expected to be of value in cases where the capillaries have not suffered organic damage. For technical simplicity, KOWARSCHIK (Vienna) recommends the use of the solenoidal field in such cases, and for all local treatment of limbs.

COLARIZI (Rome) found that the early treatment of poliomyelitis gave most encouraging results, and could be applied without danger even to the smallest children; MERDINGER (Cernauti) confirmed this report as a result of his experience in epidemics of poliomyelitis in Bessarabia. WOLF mentioned experiments in which apes injected with the virus were given fever doses of high-frequency energy; most of them died of pneumonia.

FUCHS (Vienna) discussed the possible value and technique of combined Röntgen and short-wave treatment, and ZIMMER (Berlin) suggested that the hyperæmia resulting from the latter may be responsible for the increased effect of X rays reported by several previous workers. IREDELL (London) described two cases, one of malignant disease and one of actinomycosis, which suggested that the favourable effects of radium were also somewhat increased by simultaneous short-wave treatment. Biological experiments on the production of mutations by X rays (PICKHAN, TIMOFÉEF-RESSOVSKY, and ZIMMER) have so far failed to show any "sensitisation" by the high-frequency field.

PARIS

(FROM OUR OWN CORRESPONDENT)

POMARET'S LAW ONCE MORE

THOSE who have not seen earlier references to Pomaret's law in these columns may note that M. Pomaret was once a member of the French Government and is now a member of Parliament. His law, which by the way is only in the draft stage, concerns all the liberal professions, not only that of medicine. Its guiding principle is that employment must be found for the young by the compulsory retirement of their seniors at 65. The outcry against the proposal came in part from the young, inspired no doubt by chivalrous emotions as well as by the fact that even after 65 parents may be materially useful to their offspring. M. Pomaret was invited this summer to face the music, and he did so to such good purpose and with such good grace that there is every prospect of his original scheme being decently interred and a new one evolved under happier auspices. On June 17th he met the representatives of the Confederation

of Intellectual Workers, the University Bureau of Statistics, the Confederation of French Medical Syndicates, the Confederation of Dental Syndicates, the National Veterinary Syndicate, the National Student Union, and representatives of the French lawyers and architects. After a prolonged and friendly discussion, all concerned agreed on the desirability of preparing a scheme according to which the members of the liberal professions would be obliged under State control to contribute towards their own pensions, which could be claimed at 65, but the receipt of which could be deferred at the wish of their beneficiaries. This pension scheme would also be applicable to widows and children. M. Pomaret, the University Bureau of Statistics, and certain actuaries have been requested to work out the details of this scheme as quickly as possible, in order that it may be thoroughly examined and discussed with a view to its adoption by Parliament at an early date.

A DOCTOR'S BUDGET

Recent correspondence in *Concours Médical* throws some light on the financial problems of the general practitioner in France. One writer, who professes to give not his own budget but a synthetic substitute which he says is representative of several general practitioners in the suburbs of Paris, puts the annual professional outgoings per doctor at 70,000 francs. If some 30,000 francs be added to this sum for the luxury of a wife and family, a Parisian doctor must earn some 100,000 francs a year—£750 at current rates of exchange—if he is to hold his head above water and his family in its proper social place. With regard to the 70,000 for professional expenses, 20,000 are allowed for the running of a car and 11,000 for paying and feeding a maid. Taxes run away with 8000, the rent of a consulting-room with 4000, the telephone with 2000, medical publications and post-graduate courses with 1700, and a locum tenens with 4500. The other items in this 70,000 budget are individually small and of importance only collectively. The same writer calculates that the average cost to a doctor of a consultation is 13 francs so that he is only 7 francs in pocket after a 20-franc consultation, or 12 francs in pocket after a 25-franc visit. These fees for a consultation and a visit respectively are probably above rather than below the average even if no account be taken of those patients who act on the principle that it is better (for the doctor) to give than to receive.

DEATH CERTIFICATE PROBLEMS

The Ministry of Public Health's new regulations for death certificates have caused much heart-burning. Not a few mourn those happy days when, without having to inspect a dead body or make awkward inquiries of the relatives, one airily stated that Monsieur X was dead from natural causes. Now we must hie ourselves to the house of death, and not only view the corpse, but also discover and state why the patient died. Should our honesty be more in evidence than our tact, there is nothing to prevent an outraged widow from prosecuting us for the violation of the professional secrecy imposed on us not only by the best traditions of our profession, but also and very explicitly by the law. Dr. Paul Boudin, legal adviser to *Concours Médical* has some words of forensic wisdom to say on this subject. He warns doctors against the making of incomplete or misleading statements on a death certificate, for once they are made there is no knowing where they may lead. A flat refusal to issue any death certificate is much safer for the doctor, though what the other parties concerned with the death and burial of Monsieur X are to do in this event Dr. Boudin does not say; presumably it is to be their funeral, not the doctor's, and it is in him alone Dr. Boudin is for the moment interested. It comes to this, that the interests and feelings of individuals, from the dead and his family to the doctor, have to be weighed against those of the public health authorities anxious to publish instructive vital statistics.

Another problem arising out of the new regulations concerns the remuneration the doctor earns but may not receive for the execution of his new duties. It is to be hoped that the civil authority—i.e., the municipal officials—will collect these dues on behalf of the doctor as if they were so many rates and taxes, so that he does not have to send in a bill as for personal and private service to an individual. For after all these new regulations are not so much for the immediate benefit of the defunct, his relatives and heirs, as for that of the State.

DEATH OF DR. ANTOINE BÉCLÈRE

Only a few weeks ago Dr. Antoine Béclère published a most interesting paper in *La Presse Médicale* on influenza and on the comparative importance of its specific virus and Pfeiffer's bacillus. Now he is dead, and the press is unanimous in honouring his memory as that of one of the greatest radiologists in France. It was only last year that the radiological world celebrated his scientific jubilee, when the high honour of commander of the Legion of Honour was conferred on him. A member of the Academy of Medicine, he was its president a few years ago, and he has also been president of the Medical Radiological Society of France. One of his biographers has written: "To analyse the radiological work of Antoine Béclère would be to pass in review all the medical applications of the X rays." He was, however, by no means shut up in the water-tight compartment of his own specialty, and his interest in bacteriology was much more than that of the dabbling dilettante.

THE LANCET 100 YEARS AGO

September 16th, 1837, *p.* 889.

From a lecture on Materia Medica and Therapeutics delivered at the Windmill-street School of Medicine by Dr. GEORGE G. SIGMOND.

The nettle has been employed as a rubefacient, and urtication, or the application of the urtica dioica to paralytic limbs, or in torpid and lethargic affections, has been found very successful; the young shoots, or tops, are gathered by the rustic classes to boil in broth or gruel; the juice of the leaves has been employed in hemoptysis; a conserve of the flowers and of the seed allays irritation in the kidneys, and, where stone exists, has been given, as an anodyne, with very good effect; a leaf of the nettle placed upon the tongue, and pressed hardly against the palate, has a very instantaneous effect in bleeding at the nose. Even some of the species of the fig are narcotic and poisonous; thus, the ficus toxicaria is highly poisonous; most of them have, however, the reputation of being generally demulcent, and slightly laxative; they have long been employed in domestic medicine as poultices, and our older writers on "Materia Medica," ascribe their introduction into use, in this way, to their being mentioned in Isaiah for the cure of Hezekiah, when "sick unto death." For Isaiah had said, "Let them take a lump of figs, and lay it for a plaster upon the boil, and he shall recover." "This," as Professor Burnet observes, "was two hundred and sixty years before the time of Hippocrates, and is the most ancient cataplasm of which history makes mention."

From a leading article.

Let us not be misunderstood,—though by this time parentheses of explanation are hardly necessary to ensure a comprehension of the views and language of THE LANCET.

LETTERS FROM SHANGHAI

A HOSPITAL IN THE CIVILIAN WAR ZONE

THE following are extracts from letters sent home by Dr. J. L. H. Paterson, superintendent of the Lester Chinese Hospital in Shanghai. The hospital is staffed by missionary doctors and nurses appointed by the London Missionary Society, but is financed by the Lester bequest and by business men, both foreign and Chinese, in the city. Founded in 1844 by Dr. Lockhart it was rebuilt in 1931 and now has 230 beds. About 4000 in-patients are received annually, and the number of new out-patients last year was 62,000.

August 16th, Monday.—Real fighting broke out on Friday last beyond Hongkew and round the North Railway Station. That was when the Chinese claimed that the Japanese had broken the 1932 agreement by pushing vedettes, &c., out into Chinese territory—the agreement was that neither should send men into the strip of Chapei and Paoshan. The Chinese then pushed regulars into this area and they started in earnest. The Japanese put their flagship—the *Idzumo*—up by the Japanese consulate, near the Garden Bridge, and this has caused the most terrible of the troubles, for the Chinese have been trying to bomb it, and have not been good enough at the job.

Saturday morning they first tried and hit a garage behind Broadway. We got a lot of the casualties in from that. St. Luke's Hospital had evacuated that morning. Then their second attempt was terribly fatal for they dropped three bombs on the Palace Hotel and Nanking Road. This was about 4 P.M. Cater and I were having tea when we heard the bangs, but did not know things were so near, the place was crowded with refugees. Just as I went out to the roof garden I saw a great mushroom of smoke rise from the corner of Avenue Edward VII and Thibet Road. Very soon afterwards the victims started to come—a long line of vehicles of all descriptions lined Foochow Road—coming into hospital, depositing their burdens and clearing off. From then on till late at night more were being picked up and brought in.

Foreigners (mostly Russian) were dressed and sent on to the Country Hospital. We got about 400 cases, Paulun Hospital 100, and the French Ste. Marie Hospital about 400. The staff worked splendidly—never a let up—and everyone from coolies up doing their level best. Four senior surgeons were in the four operating rooms hard at it till nearly 11 P.M. All light cases were dressed and sent out to return next morning. Heavier cases that could be fixed up were operated on and sent to a temporary hospital near by, while we kept the most serious. We had 70 corpses in our backyard by midnight, and there has been no means of getting them away till to-day, when they had increased to 105. It was a ghastly business, blood flowing everywhere. But everyone did nobly throughout. Yesterday was a quieter day, but we had about 75 in. The consul has advised all women and children to evacuate. (I had to run down a minute ago, with some sort of alarm, but it was only that the nose of an anti-aircraft shell had come through the autopsy-room skylight—the second to drop within the compound.) As I write this a fierce cannonade is going on round Hongkew and Pootung—some pretty big stuff being put over. . . .

We all keep well, though a bit tired. It is unfortunate that the trouble broke out just after two of our sisters went off for holiday—Miss Dey was due to arrive from Kuling last Friday but was held up at Nanking where she still remains I believe. Miss Sharpe and Miss Smith have been splendid, Dr. Towers above praise, and Cater and the other surgeons splendid all through. Gas has been cut off, but we have coal for steam for some time still. All of us on the top floor are messing together to save cooking, as it has to be done largely with small electric heaters and charcoal. Food for hospital is almost unobtainable so we are having to fall back on our stocks—laid in last week.

We are using dressings up fast, but I put a notice in two papers asking for old linen and there has been a good response. We have had several volunteers working, cutting up gauze and rolling bandages and looking after a bunch of fourteen derelict babies. We have the little ones laid out on mattresses—four to a mattress—and they are a noisy crew in a side-room. One man brought in ten cases of condensed milk this morning, another a pile of samples of cloth from his office, another went hunting for other supplies, and so on. Fine work.

* * *

Tuesday.—Nothing much to add—a very noisy night. Gas warning at 4.15 A.M. Got round to see windows all closed, but only cordite fumes I think. Fierce bombing and gun-fire from Garden Bridge down river.

Hospital is, of course, very full indeed and very busy; about 90–100 cases a day since Sunday; many are bad wounds, cranial and abdominal. The surgeons have been doing a roaring business. But it is slacking off a little. The chief trouble in one way is the number of people brought in as suspected spies or Japanese, after being set on by the crowd. Koreans, Chinese, and even to-day a Philipino—the champion boxer of Shanghai. I have had quite a job looking after them till police protection comes along. There has been a little rioting, chiefly at rice shops, but with such enormous numbers of refugees in the place it is only to be expected. Some say there are over 200,000 in this part of the settlement alone.

Japanese planes are just passing overhead on night bombing I suppose—but that will be far enough away. The Lester Institute has been turned into a hospital and the General Hospital staff and patients removed to it. The Sacred Heart Hospital was evacuated to-day. All this means more work, but with emergency hospitals to deal with the less urgent cases we will manage all right. I have a number of people on the outlook for supplies of various kinds for us. An hour or two ago I got a fine supply of morphine and syringes. Morphine has run very short in the Settlement. While writing this a telephone call told me that a friend is sending 1000 lb. of cotton-wool first thing to-morrow. Three or four friends with cars are running round bringing in stuff I have located. But indeed, if I am in a hurry for anything, I catch the first private car that comes into the compounds and send it off to collect. No one dreams of refusing. I got a promise of 30 tons of coal to come in to-morrow and more if I can get transport. While our staff so far as regulars are concerned is so depleted by folks away on holiday we have plenty of volunteer help. . . .

There are long lines of people coming hunting for missing relatives; plenty of sad faces leave the place—still missing—but a considerably number are found. In the fourth floor west main ward, as I was standing with Mr. Baxter looking at the beds closely crowded—plank and stretcher beds in addition and about ten less urgent on mattresses on the floor—a group of four came in behind us and started looking at the patients. Suddenly a man at the far end started yelling at the top of his voice and the group let off an answering yell and went off down the ward calling to him, and all the time they were coming he was shouting, "Pu yao ching (not very serious), Pu yao ching," and pointing to his leg.

One big sturdy man brought in with a little lad of six was in a very sad way—the lad was only a bit bruised and we got a woman refugee in the church next door to take and look after him. Dr. Towers took him along to see his father and say goodbye. Ten minutes later the father died. The foster-mother to-day announced she would not give up the boy for anything, and is going to adopt him. Two

little babies of about one and two years old—bonny little kiddies—were brought in the arms of a big brawny Sikh—all that was saved from a full sampan that was injured and sunk. It is an interesting thing in the early mornings when there is usually an air raid or two on, and Archies spitting all over the place, to hear the full-bodied sound of the hymns being sung at morning worship by the refugees in the church next to us.

We have been and will be kept safe and we are all, oh so glad, to be of use to this army of helpless, wounded, and penniless people.

* * *

Unconscious humour from second page of *North China Daily News:* Long list of short items of news—top one—British Forces Recreation Club dances stopped for the present on account of the heat!

August 23rd.—While we were finishing tiffin we heard a shell streak down somewhere near at hand, and saw the great blast of dust and smoke rise just at Sincere's corner. A straying shell—big one, too—but with terrible consequences. This was only four hours ago and we have had over 200 in already—a good many light cases, but many very severe. In our mortuary alone there are about 50 dead. They say 200 were killed on the spot.

August 24th.—To-day's report is 150 killed (many have died since) and 450 injured. I was really proud of the way our people went at it. The experience of nine days before stood us in good stead. By 3.30 we had cleared up. Operations, of course, went on to much later. Out rooms in out-patients and emergency were cleared—floors washed—light cases sent off—about 10 medium cases transferred to other hospitals and about 40 left in our wards, on trestle beds, floors, &c. By 4 P.M. even the courtyard had lost its blood stains, fresh stocks of dressings, &c., were in the rooms and all ready for another burst which one prays may never come. Five have died overnight. As usual there were some most weird occurrences. A big hefty fireman came in with a tiny baby boy in each arm (twins about a year old). The mother had been blown to pieces, the babies had nothing but a few scratches. One man who was brought in dead was completely severed across the middle, but was held together by almost uninjured clothes.

One of the saddest parts is the immediate rush of people looking for relatives. Nothing will satisfy them but a complete tour of the wards, and then the mortuary. Poor folks—many go away in tears to hunt elsewhere; but others, in their gratitude at having found some loved one still safe and being cared for, will almost lie down on the floor. One scholarly old man in long gown with fan and straggly beard, with his old wife and daughter-in-law, came hunting for his only son. I found him in the out-patients' operating room—the old man was shedding tears of joy over his son on one of the operating tables, while the surgeon was cleaning up a badly smashed foot. The son was too much taken up soothing his father to pay much heed to the work on his foot.

I have just got started a scheme for the centralising of names of patients in various hospitals. Numerous emergency hospitals of all kinds are dotted over the International and French areas. Refugees are everywhere, in alleyways and crowded buildings, and in 60 camps with 80,000 refugees. No one knows where anyone else is. I got hold of a social service worker and a voluntary clerk, and got them to work in the hospital with full lists and details. We have now got backing from the Municipal Council and are to extend the work to take in other hospitals, with a central office. Also the Public Health Department has put a man on to checking up all hospitals and accommodation daily.

We took in 65 yesterday on top of some 250 already in—in a 230-bed hospital! Also I have got Dr. Robertson to start in on a Convalescent Refugee Camp with good medical staff, to clear our hospital of less ill people with no homes to go to. It is amazing what help we have had once we got into touch with the right people and made our needs known.

I can hardly get one sentence of this written without interruption. We fall asleep almost before we get to bed and I for one hear nothing of guns or bombs or anything but the telephone till 5 A.M. It's a great life. We do not know what has happened to Medhurst Compound. Fires lie all across between it and us. Much bombing has taken place round there, but until the fighting area passes beyond we cannot get information. Dr. Galbraith is here with us, Margaret Williamson Hospital being closed. Much of its equipment is in a school in Tifeng Road (near Country Hospital), where a refugee maternity hospital has been started.

There are no incoming mails these days. Our letters out go with refugees to Hong Kong.

THE SERVICES

ROYAL NAVAL MEDICAL SERVICE

Surg. Comdr. K. A. I. Mackenzie retires at own request, with rank of Surg. Capt.

Surg. Comdr. P. J. A. The O'Rourke to *Drake* for R.N.B.

Surg. Lt.-Comdr. D. C. Drake to be Surg. Comdr.

Surg. Lt.-Comdr. H. G. Wells to *Drake* for R.N.B. and to *Caledonia*.

Surg. Lt.-Comdrs. (D) G. Baker to *Ganges;* and L. A. Moules to *Pembroke* for R.N.B.

Surg. Lts. J. A. Page, M. H. Adams, R. M. Bremner, J. G. Slimon, C. V. Harries, and T. F. Davies transferred to permanent list.

Surg. Lt. (D) S. J. Atkinson to *Glasgow* (on commg.).

ROYAL NAVAL VOLUNTEER RESERVE

Surg. Lt.-Comdr. H. G. Ungley to *Sheffield*.

ROYAL ARMY MEDICAL CORPS

Capt. C. L. Day to be Maj. (prov.).

Temporary Commissions: Maj. J. D. Dillon relinquishes his commn. and retains the rank of Maj.

Short Service Commissions:—Lts. (on prob.) confirmed in their rank: V. Bennett, R. J. Niven, D. G. Levis, S. H. Gibbs, C. M. Arthur, R. D. Menzies, K. F. Stephens, R. B. Robertson, F. Livesey, N. Bickford, C. E. McCloghry, E. Gareh, J. B. Bunting, O. W. W. Clarke, A. T. MacM. Glen, G. G. Sheriff, and G. M. Curtois.

REGULAR ARMY RESERVE OF OFFICERS

Lt.-Col. W. Byam, O.B.E., having attained the age limit of liability to recall, ceases to belong to the Res. of Off.

ARMY DENTAL CORPS

Short Service Commissions: Lt. C. H. James to be Capt.

TERRITORIAL ARMY

Hon. Col. F. Marsh, C.B.E., T.D. (Col. (retd.), T.A.), vacates the appt. of Hon. Col., R.A.M.C. Units, 48th (S. Midland) Div., and Sir Bertram J. T. Ford, Kt., T.D. (Maj. late T.F.), is appointed.

Lt.-Col. H. F. Wilkin, M.C., T.D., having attained the age limit, retires and retains his rank, with permission to wear the prescribed uniform.

Capts. E. D. Gray and W. Morrison, M.C., to be Majs.

J. A. W. Segerdal (late Offr. Cadet, Queen's Univ. Belfast Contgt., Sen. Div., O.T.C.) and D. S. Austin to be Lts.

ROYAL AIR FORCE

Group Capt. Andrew Grant, M.B.E., who recently returned from service at Lahore as P.M.O. with the R.A.F., India, since June, 1935, has been appointed to the Directorate of Medical Services, Air Ministry, for staff duties.

Group Capt. Grant joined the R.A.M.C. in January, 1915. He has had experience at the Air Ministry, and in 1929–31 was

senior medical officer at Uxbridge Depôt and in command of the officers' hospital.

Wing Comdrs. R. S. Overton to No. 2 Flying Training School, Digby, for duty as medical officer; and E. N. H. Gray to No. 10 Flying Training School, Tern Hill, for duty as medical officer.

INDIAN MEDICAL SERVICE

Lts. J. W. R. Sarkies and F. MacD. Byrn are restd. to the estbt.

To be Lts. (on prob.): J. L. Mewton, A. F. Goode, L. U. Kamm, T. Denness, A. C. Glendinning (secd.), G. B. Jackson (secd.), J. H. Briscoe-Smith (secd.), and E. L. Wilson (secd.).

Indian Medical Department.—Lt. (Sen. Asst. Surg.) J. O. Dewey retires.

COLONIAL MEDICAL SERVICE

Dr. W. E. Hadden has been appointed Medical Officer, West Africa, and Dr. H. D. Sutherland, M.O., Northern Rhodesia. Dr. D. E. C. Mekie (M.O.) becomes Professor of Clinical Surgery, College of Medicine, Singapore, and Dr. H. G. Wiltshire (Zanzibar), Senior Pathologist, Uganda. Dr. P. J. Gonsalves (late Asst. M.O.) becomes Medical Officer, Government Hospital, Seychelles.

DEATHS IN THE SERVICES

The death occurred on Sept. 13th at Savernake Hospital, Marlborough, of Col. GEORGE MILLS GOLDSMITH, C.B.E., retired colonel, late R.A.M.C. Born in 1876 he was educated at Dublin University and graduated as M.B. in 1898. He joined the R.A.M.C. in 1899 and became major in 1910. He served in the South African War, 1900–02, and took part in the operations in the Orange Free State, including those at Paardeberg and the actions at Poplar Grove, Karee Siding, Vet River and Zand River, and in the Transvaal, including actions near Johannesburg, Pretoria, and Diamond Hill. He was awarded the Queen's medal with four clasps and the King's medal with two clasps. He also served in the European War from 1914–19, was mentioned in dispatches, and created C.B.E. (Mil.) in 1919. He was a specialist in advanced operative surgery.

Lieut.-Col. HAROLD CROSSLEY HILDRETH, D.S.O., O.B.E., retired lt.-col., R.A.M.C., died on Sept. 11th in a London nursing-home. He qualified at Edinburgh in 1900, and took the Edinburgh surgical fellowship two years later. Joining the R.A.M.C. in August, 1903, he became captain in 1907, being then stationed at Fermoy. He served in the European War from 1914–17 in France and Belgium, and was twice mentioned in dispatches. He was created D.S.O. in 1917 and O.B.E. (Mil.) in 1924. He resided at Colchester.

GRAINS AND SCRUPLES

Under this heading appear week by week the unfettered thoughts of doctors in various occupations. Each contributor is responsible for the section for a month; his name can be seen later in the half-yearly index.

FROM A LONDON PHYSICIAN

III

WHAT should a physician read? This is a question to which there are as many answers as there are to that other inquiry, "What should a man eat?" Most men eat what is set before them or what they like. Their reading is determined by leisure, taste, professional needs, the drug habit, intellectual vanity, mental nausea, and the critics. Nevertheless, having asked the question, I must try to answer it.

The physician should have as the basis of his professional diet some solid text-book. This furnishes a pabulum of fact and speculation which he can regurgitate for Conjoint students. I confess that I once read the first hundred pages of Osler. I have never quite recovered from it. Vitamins are needed to prevent professional xerophthalmia; the weekly medical journals contain, it is said, a sufficiency of these. An occasional mouthful of one of the quarterlies or of a transatlantic journal serves to purge the soul. To keep pace with his patients, especially with those from beyond the ocean, the physician must also be familiar with those leaflets and brochures which come with every post, which seem fated for the waste-paper basket and in which panaceas masquerade in all the trappings of science. Not all the leaflets are devoid of reality but the majority are Utopian.

He will do well to absorb one of the heavier Sunday papers. There has been much talk about the difficulty of the employment of leisure. The Sunday papers have removed all fears on this score. Attendance at church, golf, and the afternoon nap can have no place in the life of a man who does justice to one of these tremendous publications.

* * *

Beyond giving these simple rules on reading, I hesitate to advise anybody. Indeed I imagine that the man who is able to translate these rules into practice would become a pundit set above advice. I personally like biography and history rather better than novels: but in these days the three are so much alike that a preference for any one of them is rather like that of the medical student who said that he loved nurses more than women. A quiet life of Crabbe and Harold Nicolson's "Byron, the last journey" have each their interest. In the latter Byron's dietetic efforts to reduce his weight are recorded as well as his irritation with Mrs. Shelley. Cameron's article on Byron's lameness, published about fourteen years ago, is interesting to read alongside of Nicolson's book.

* * *

Certain diseases permit of a display, in clinical lectures, of literary virtuosity calculated to impress but in practice apt to bore the medical student. Obesity and the psychoses are in this respect admirable for the pedant. The reference by Hamlet to this too, too solid flesh which, he wished, would resolve itself into a dew is brought up in lectures on fat metabolism. The death-wish of the hero is degraded to the chemical process of water formation by oxidation of fat or to the social desire for slimming. In Francis Hackett's "Henry VIII" there is quoted the gorgeous and bitter criticism by Surrey of a powerful King—"whose glutted cheeks sloth feeds so fat, as scant their eyes be seen."

In passing we may note that Adler must have appreciated the psychological outlook of Hackett's "psycho-historical" book through whose pages marches the Will to Power.

Not unexpectedly, the psychoses have attracted literary men. Ophelia's madness is so lifelike that psychiatrists are able to argue as to whether it was manic or confusional, although most regard it as manic. Some of Dostoievsky's characters are of course certifiable. I have always felt that the epileptic Smerdyakov in "the Brothers Karamazov" was more natural than the more elaborately drawn hero of "Crime and Punishment."

I should think that a medical training is a disadvantage to the novelist who would portray an insane hero. The modern medico, imprisoned in the network of psychological terminology, is in danger of producing a case sheet rather than a human figure.

* * *

I hope it will not be thought that I read exclusively for the sake of pedantry or of the fragments of medicine which are to be found in the rich soil of English literature. Rather is it that one cannot help stumbling over these fragments. If one really wants sound clinical observations with enough humbug to make them jolly one has only to turn to the pages of the great English physicians who flourished—in a richer fullness than we do to-day—in the reign of Queen Victoria. Then there is Trousseau's eloquence. His description of the differences between the asthmatic and the bronchitic is a masterpiece. Such phrases as "il a besoin d'une grande masse d'air" ring in the crowded corridors of memory, and are apt to drown the sibilant squeaks and sonorous rhonchi of the text-books.

* * *

The relation of pupils to teacher is no less worthy of consideration in regard to medicine than it is in regard to arithmetic. The impromptu efforts in the wards and out-patients permit of wit and, for those teachers who indulge in it, insult. I think that care should always be taken to avoid anything which would hurt the patient's feelings, and even the student should be spared a little. The sufferer from carcinoma or tuberculosis is not always gratified by wit or humour. But in lectures one can really let oneself go—up to a point. Many lecturers are sensitive to their audience. The teacher may start with a pleasant glow of self-importance: Demosthenes addressing whomever he did address. But the various needs of syntax, of sequence, of memory, and of covering the ground begin to oppress him. Notes seem to hinder rather than help. He sees Jones yawning and Brown already asleep. The wild look in Smith's eye reveals what is going on in that rapid brain—who has won the 3.30? Green is staring into the remote distance. Dare he wake Brown up? No, that would be too obvious. The most he can do is to refer to Benzedrine which is the ingredient of pep pills for American students. The minutes drag their leaden wings. Then he remembers that the very essence of English life is humour and he tells a story which when told by his Celtic (surgical) chief fifteen years before had seemed witty if not really funny. Then he also recalls that Demosthenes had strengthened his voice by declaiming to the stormy seas, but that he had not had a placid audience of Englishmen from Wales, Scotland, and Ireland to overcome. A few minutes later Brown wakes up, the hypnotism which enmeshed the lecturer is shaken off and he is able to deliver a fairly lucid account of abdominal pain or other delightful if technical subject.

CORRESPONDENCE

THE HEALTH OF MEDICAL STUDENTS

To the Editor of THE LANCET

SIR,—As one who has recently qualified, I have been very much interested in the correspondence in your columns on the subject of the health of medical students. I think that Mr. Girling Ball has rather under-estimated the mortality among his students, because from the hundred or so who were my contemporaries in the first year at Bart.'s no less than seven were dead six years later. Of these, one died through an accident, but the remaining six from such varied causes as lymphadenoma, tuberculosis, neoplasm, lobar pneumonia, nephritis, and cerebral abscess. This, however, is no index of the morbidity among us: of the group of six men to which I belonged, one is dead and two had considerable periods in hospital largely due to the life which we had to lead. One other passed through a period of psychological upset referable to, but not interfering with, his work. Of the six, four lived at home and all had adequate fresh air and recreation. These figures are too small to be anything but an indication that much goes on beneath the surface which does not come to the notice of the authorities.

I think that the most potent factors tending to ill health among students are psychological in origin. It is not six years' work but six years' worry to many men—worry about exams to some, about ways and means to others. Moreover, there is a distinctly morbid side to the curriculum which leaves its mark on the more sensitive and reflective natures. Added to this, there is six years of travelling in crowded trains, working by artificial light for long periods, and snatching hasty meals between lectures—not enough on their own to cause ill health but factors acting in the wrong direction.

The students of the older universities seem to be more fortunately placed, in so much as their first three years are passed among more pleasant and leisurely surroundings, than their brethren in London. It takes eight terms to work for the 2nd M.B. Lond., but Oxford and Cambridge require nine; and yet their students come down in a much better condition, mentally and physically.

On the constructive side there is much to be done. A compulsory holiday of at least one month in the summer should be enjoined for all clinical students. Lunch-hour lectures and classes should be abolished. As Mr. Ball suggests in the current number of *St. Bartholomew's Hospital Journal*, a medical officer should be appointed at each hospital to whom the student should be encouraged to report when sick and who would have beds at his disposal.

Finally, I would suggest to Sir E. Graham-Little that the average student would rather have his preclinical burden lightened than be rewarded with a B.Sc. for further efforts. At the most it is only another roll of parchment, another hood to wear—quite useless to him professionally. There is always the primary fellowship for the more gifted and ambitious to work for. Moreover, it has always seemed to me that the University of London has much to answer for in forcing the pace in medical studies.

I am, Sir, yours faithfully,

R. RUSSELL PREWER.

Kent and Canterbury Hospital, Sept. 12th.

To the Editor of THE LANCET

SIR,—May I, as a student, attempt an explanation of the life led by students as it affects their health. Students in the first year of their studies are on the whole a very fit collection of young men and women. As the course proceeds there is a steady decline in the general standard of physical fitness. A pale face, breathlessness after climbing a few steps, a spotty complexion, perpetual tiredness, dull eyes, nervousness: these are surely not indicative of health.

The reason for this degeneration in health is first of all the student's environment and secondly the large amount of work (not only text-book cramming but long periods of standing and working in an unhealthy atmosphere) that he has to get through to satisfy himself that he is a match for the examiners. In other words, it is the examination bogy that has caused much trouble not only among medical students but amongst others who certainly do not follow so long and intensive a curriculum.

The environmental conditions of students when they return to their homes or "digs" after their day's work depend largely on their means. A dingy basement room, badly lit, is not suitable for the study of medicine, and a conscientious student finds it necessary to do at least two or three hours' work in the evening. Other students, though more fortunate in their home environment, often smoke and drink to excess and are prone to be "nervy," a condition caused perhaps by lack of sleep brought about by social activities plus work. A student I know (and he is not the only one) played bridge, went to a dance, to a film première, to a bottle party, and to a hospital dinner all in the same week. He did his two hours of work at home, but when? From midnight (if he was lucky) until two or three a.m. Quite a large proportion of students do not give themselves a chance to be fit. At hospital, especially during the later clinical stage, the environment is not exactly a healthy one, and the amount of work to be done is in no way diminished. Soon the student's vacation will be taken from him; this is dangerous and should be strenuously opposed. A hard game of rugby once a week is not to my mind a health insurance when the body is fatigued and the brain tired; neither is a game of ping-pong after a hurried meal a tonic.

The student's health is largely in his own keeping, and it is up to him to see that he does not abuse it. The authorities, however, are in a position to help him by a modification of the present system of medical education, which necessitates the useless cramming of knowledge from the thousand-page text-book (originally two hundred pages); and to allow him a breather by giving him a reasonable vacation, especially during his later clinical studies. I am, Sir, yours faithfully,

Sept. 13th. MEDICAL STUDENT.

ACCLIMATISATION TO HIGH ALTITUDES

To the Editor of THE LANCET

SIR,—In your annotation in to-day's issue you point out that no single controlling factor has been identified in the production and relief of mountain sickness. Oxygen saturation of the blood, red cell count, alkali reserve, and carbon dioxide content do not appear suitable guides as to whether mountain sickness will or will not occur in any individual. Therapeutic measures—e.g., administration of ammonium chloride or of carbon dioxide—have failed so far. Of course administration of oxygen is a certain measure.

At a recent meeting of the Physiological Society it was recorded that the thyroid gland plays an important part in the poisoning by oxygen at several atmospheres' pressure; removal of the thyroid gland from white rats prevents this oxygen poisoning under conditions which are otherwise fatal. At high altitude we have the opposite condition—namely, lack of oxygen—and it has been proved that metabolism is decreased in unacclimatised animals. In this case the thyroid is, with all other important organs, depressed and administration of thyroid extract and also pituitary extract (which has a thyrotropic influence) might be well worth trying on future Everest expeditions.

Extensive experiments have proved that mammals cannot be acclimatised to live indefinitely under 10 per cent. oxygen or about 20,000 feet altitude, heart failure being the main obstacle. Deterioration becomes rapid on Everest at 21,000 feet.

As all important organs are affected by low oxygen pressure no therapeutic measure, which does not aid all these organs, is likely to be of any value. For this reason many authorities advocate the use of oxygen at the very high altitudes on Everest.

I am, Sir, yours faithfully,

London, N.W., Sept. 11th. J. ARGYLL CAMPBELL.

SOMNIFAINE NARCOSIS

To the Editor of THE LANCET

SIR,—May I answer briefly Dr. Ström-Olsen's criticism of my communication on the Technique of Somnifaine Narcosis published in your issue of Sept. 4th?

In the first place Dr. Ström-Olsen can bring no fresh facts to support his statement that ketosis is a complication of somnifaine narcosis, and refers once more to the original 20 cases on which he bases his theory. Apparently he has not attempted the treatment since without the addition of insulin. What I might term the "ketosis complex" has so obscured his vision that he cannot see that there must be some fallacy in his reasoning if another clinician, using similar (or larger) doses of the drug in 100 completed cases, involving over 2000 urinary analyses, cannot demonstrate the presence of ketosis. Parfitt (1936), who has tried *both* methods, states that in his opinion "if the daily intake of nutrient fluid is not allowed to fall below 50 oz. the evidence suggests that acetone will rarely be found in the urine." Meerloo (1933), to whose excellent thesis I am much indebted, reports that up to 1929 he had completed 500 cases with no mortality in the last 350. He makes no mention of ketosis. I have not at hand the figures of the Swiss physicians who first started the treatment, but they must by this time amount to over a thousand cases, and I have yet to hear that they regard ketosis as a complication.

Although very little on this subject has been published in the British Isles, the annual reports of the Board of Control for 1934 and 1935 show that in the few hospitals where prolonged narcosis has been attempted the insulin modification has not always inspired confidence. Brunton (1934) and Macmillan (1935), working in Nottingham, have given up the routine use of insulin because they consider that it "confers no additional therapeutic benefit."

In spite of the attractive theory of disturbed carbohydrate metabolism after somnifaine, the fact must be faced that the use of insulin in prolonged narcosis is purely empirical. The danger of relying upon insulin as a preventive, and the urinary analysis as an indication of toxæmia, is that the physician may be tempted to neglect that close clinical observation of the patient which is the only efficient safeguard. It cannot be too strongly emphasised that the patient's life may be jeopardised without a trace of acetone appearing in the urine.

Dr. Ström-Olsen is also impressed by the fact that I failed to complete the ideal course of narcosis in a few cases. My considered opinion is that it is impossible for anyone, no matter how excellent his judgment, to carry out conscientiously prolonged

narcosis without a few abortive attempts. With regard to the other points raised, the giving of injections at fixed times is merely a matter of convenience to suit the routine of English mental hospitals, and ensures that the patient is examined by the medical officer. The dosage is regulated by the condition of the patient, and the drug may be ordered or withheld as considered desirable. A recent communication by McCowan (1936) from the Cardiff clinic (where most of the treatments have been carried out in this country) reads: "In the majority of cases the injection is given at the same time each day." One need say no more on this point.

I have searched my article in vain for any reference to "amnesia on 2 c.cm. of somnifaine per day," which is another point raised. The only possible explanation is that the assertion made by me that there is amnesia for the period of induction is called in question. On this matter I am quite unrepentant. After 100 c.cm of somnifaine in 20 days no patient is likely to remember the first few pin-pricks. I have perused the annual report of the Devon Mental Hospital (recommended by Dr. Ström-Olsen in his letter) and, as the report deals with only 6 cases, cannot see that it helps to clarify the position.

While no one questions that somnifaine narcosis is possible combined with insulin injections, most informed readers will agree with me in my contention that the success the advocates of the insulin-somnifaine technique have achieved is due not to the combating of any assumed disturbance of carbohydrate metabolism by insulin but to increased experience of the action of the drug, and of the snares and pitfalls which beset the pathway of the novice in this most valuable form of therapy.

I am, Sir, yours faithfully,

D. MENZIES.

Plymouth Mental Hospital, Ivybridge, Devon, Sept. 11th.

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INOCULATION OF HUMAN LEPROSY INTO SYRIAN HAMSTER

To the Editor of THE LANCET

SIR,—An experimental animal susceptible to human leprosy has long been wanted; for there is as yet no record of an experiment in which an animal has shown a massive infection after being inoculated with material containing Hansen's bacillus from a human case.

During my recent visit to London Sir Patrick Laidlaw, F.R.S.—to whom I wish to express my thanks—informed me of the successful inoculation of rat leprosy into the Syrian hamster (*Cricetus auratus*). He said that experiments with human leprosy had not given the same results as with rat leprosy, possibly because suitable material for work was not available in London, and he suggested that I carry out experiments in Palestine. The results have exceeded all expectations, particularly in view of the fact that even monkeys have so far not proved satisfactory.

The following method was adopted.

Young animals were splenectomised and the skin in the neighbourhood of the incision was separated from the fascia of the abdominal muscles over a wide area without increasing the original incision—i.e., by introducing a fine pair of scissors between the skin fascia and separating them as widely as possible. A fragment of a human lepra nodule (obtained through the kindness of Dr. T. Canaan, the devoted physician of the Jerusalem Leprosarium) was placed in the space between the skin and fascia as far as possible from the splenectomy incision. This incision was closed with catgut after the nodule had been embedded. After it had been carefully closed the animal was further given an intraperitoneal inoculation of macerated leprous material. The enclosed fragment lay in a space devoid of blood-supply and became attached to the underlying muscle by fibrin. Subsequently connective tissue formed, attaching the nodule firmly to the muscle. Layer after layer of fibrous tissue formed round the original fragment, until after six weeks there was a mass four times the size of the original implant.

Three animals were treated in the above manner on July 23rd, 1937.

Next day a hard mass, about 1·0 × 0·7 cm., not attached to the muscle or skin, was found under one of the mammæ on the right side of one animal. It was suspected that this mass might have some relation to the previous treatment to which the animal had been subjected. The tumour was removed and found to consist of a dense fibrous capsule surrounding necrotic tissue. The origin of this tumour has not yet been determined, but it may have originated from one of the mammary glands. In any case it had nothing to do with the inoculation of lepra. Smears made from this tumour showed no leprosy bacilli. At the time of biopsy it was noted that there were numerous lesions on the skin of the abdomen (abrasions and small patches without hair).

On August 31st one animal was found dead and unfortunately putrefaction was too far advanced to allow examination. A second animal (the one from which the tumour had been removed) was found to be aborting and in a weak condition. It was immediately sacrificed. The following facts were noticed. The tissue round the second operation wound was necrotic and covered with white curdy material. The abrasions of the skin, particularly near the neck, were still noticeable. A nodule about 1 cm. in diameter was found implanted into the abdominal muscle, and smears from this nodule contained swarms of lepra bacilli typical in arrangement. They were much more numerous than in the human nodule used for the experiments. The site of the second operation was swarming with lepra bacilli. The same bacilli were found in skin abrasions far removed from the site of the original inoculation. *Lepra bacilli were also found in liver smears*, thus proving that a systemic as well as local infection had been established. It is interesting to note that between August 24th and 31st leprosy bacilli had multiplied extensively at the site of the second operation.

On Sept. 1st the third animal was killed. A fibrous nodule again about 1 cm. in diameter was found adherent to the abdominal wall and again smears contained innumerable lepra bacilli. The connective tissue in the immediate neighbourhood of the nodule was also infected.

On Sept. 1st a fourth animal was also examined. This animal had been splenectomised on July 24th, but the fragment of human material had been embedded in the muscles of the left thigh. On biopsy not a trace of the original material was found on the site of implantation, but there was a large lymphatic gland in the left groin. This gland was caseating in the centre, and smears showed innumerable leprosy bacilli.

The fact that a heavy infection was established in three animals, and that in one of them there was a systemic infection, all within six weeks, prove that the above findings are not accidental and that in the Syrian hamster, at least under the conditions of experiment described above, we have an animal susceptible to human leprosy. This will, no doubt, both stimulate and facilitate further research.

It should be pointed out that the Syrian hamster is in many ways a very valuable laboratory animal. Unlike the Chinese hamster it breeds readily in captivity. It is useful for research on leishmaniasis

and owing to its susceptibility to *Brucella abortus* (considerably greater than that of the guinea-pig) it is the animal of choice for work on contagious abortion of cattle. It has been bred in the Hebrew University, Jerusalem, since 1930, and colonies from Jerusalem have been successfully established at the National Institute for Medical Research in London, and in Paris. There should be no difficulty therefore in supplying laboratories with it.

I am, Sir, yours faithfully,

S. ADLER.

Hebrew University, Jerusalem, Sept. 2nd.

DERATISATION

To the Editor of THE LANCET

SIR,—It is evident from your report of the proceedings of the International Health Office (August 14th, p. 408) that deratisation of ships is now comparatively simple. Presumably it can be left to the rats themselves to effect reratisation. The question, however, that must now arise—and it is a question the International Health Office ought to face without delay—is whether the next step should be dereratisation or merely rederatisation. I cannot help thinking that it might be wiser for the office to reconsider its terminology and outlook ab initio, and concentrate in future on the deshipisation of rats.

I am, Sir, yours faithfully,

PATHOLOGOLOGIST.

Queen Mary's Hospital for the East End, E., Sept. 8th.

*** Our correspondent's letter recalls a protest against the word "deratisation" published in the *Medical Officer* of July 4th, 1936. The writer described it as "the most agglomerate hybrid I can think of offhand, formed of Latin prefix + A.S. noun + Greek inflexion + a vestigial Latin inflexion + O. Fr. termination." Who makes words such as these, he added, and why do we use them?—ED. L.

OBITUARY

ANDREW HUTTON WATT, M.B., F.R.C.S. Edin.

ON Sept. 3rd Dr. Andrew Watt died at his home in Johannesburg, having been ill for some months following an attack of influenza. He was one of the pioneers in South Africa of diagnostic radiology, especially in relation to affections of the chest, and the fact that this specialised knowledge was only part of his wide equipment as a general physician gave to his interpretation of radiograms an exceptional value in diagnosis and prognosis. His keen interest in disease, especially silicosis, and accidents arising in the gold-mining industry led him to consent, a few years ago, to abandon his large consulting practice and to accept a full-time post as chief medical adviser to the Rand Mutual Assurance Company. His duties in this capacity lay not only in diagnosis and assessment for compensation, but also in supervision and treatment, and included the planning of the new hospital just built by the company for the treatment of insured miners. His last visit to this country was paid three years ago for the express purpose of collecting information in order to make sure of incorporating the best features of modern European institutions in this hospital.

Andrew Watt was born in 1871, the son of Sir Thomas Watt, of Edinburgh. He was educated at the Royal High School and Edinburgh University, graduating in medicine with honours in 1897. After holding resident appointments at the Royal Infirmary and the Royal Hospital for Sick Children, he took his F.R.C.S. in 1899, obtained the coveted post of assistant to Sir Harold Stiles, and set up in Edinburgh as a surgeon. Soon, however, the formation of an Edinburgh hospital unit attracted him to volunteer for service in the Boer War. After peace was declared he went back to South Africa, taking with him an X ray plant, one of the first to be set up on the Rand. He held for a time, with a general practice, the part-time post of medical officer to the Simmer and Jack Mine and helped to initiate and organise a system of training native hospital orderlies which has since been developed on a large scale. About that time the realisation that silicosis was taking serious toll of the mining population aroused general interest in preventive measures and many of Dr. Watt's suggestions for the improvement of conditions of work were adopted. His influence in the enforcement of methods of allaying dust and of mine ventilation was much greater than anyone without inside knowledge would realise, for his modesty was extraordinary and his ideas were more likely to be put at the disposal of informal committees than to be set out in detail in medical journals. His publications were indeed few and mostly took the form of contributions to medical societies; they included a thesis jointly with Dr. Louis Irvine on miners' phthisis on the Witwatersrand. His intimate personal knowledge of the work of medical benefit societies was of considerable help in recent years to the South African Medical Council when they were called upon to advise the Government on appropriate legislation.

This experience also stood Dr. Watt in good stead, when he left the mine hospital to become a consulting physician and radiologist in Johannesburg. His association with the Rand Mutual Assurance Company, at first on a part-time basis, began shortly after the late war; and the reputation of the company for fair dealing owed much to his wise counsel. At about the same time he became a member of the honorary staff of the Johannesburg General Hospital. His work at the assurance company became more and more arduous as the mining industry grew, and some ten years ago he decided to retire from consulting practice and devote his whole energy to its service. The last few years of his life involved the strain of working under the burden of much physical disability. He carried on with great courage. His kindly courtesy was that of a strong man. His patients trusted him, and all branches of the profession held him in esteem; he did more than his fair share of handling sick colleagues.

It was the combination of radiological and medical experience, grafted on to an early training in surgery, with a keen clinical sense, and a balanced appreciation of the value of laboratory investigations that ensured Dr. Watt's professional success. A friend writes: "Andrew Watt's personal qualities were no less distinguished. He was a shrewd judge of human nature, quick to detect and to expose vanity with kindly chaff. His humour was dry rather than boisterous. With characteristic modesty he used to say that every other member of his year had become renowned; he alone remained a nonentity. Like many other quiet modest people he was often a bold innovator. He achieved his influence by his personality; he lacked the faculty of self-advertisement. His home life was a piece of Scotland transplanted. He loved his home,

and was often accused by friends whom he visited of cheering up only when the time had come to return to it. Yet he was a good international mixer, a quality of inestimable value in South Africa, to-day as in the past. His death just at the time when his special efforts of recent years were coming to fruition is a tragedy."

Dr. Watt married Margaret Campbell of Saltcoats. She survives him with two daughters and a son who is studying medicine in Edinburgh.

Dr. ARTHUR BABINGTON BLAIKIE, who died on Sept. 7th at the age of 73, belonged to the third generation of Blaikies practising at Oswestry in Shropshire. After attending the grammar school of his native town he was sent to Caius College, Cambridge, in 1881 and qualified in 1887 from St. Thomas's Hospital, taking his Cambridge M.B. two years later. Returning to Oswestry to join his father, Dr. Robert Blaikie, he became surgeon to the Oswestry Cottage Hospital. During the war he worked for the troops in training at Park Hall camp, Oswestry. He married in 1897 Louisa Frances, daughter of William Hayward. For the last few years of his life he lived in retirement from practice.

The death is reported from Clifton of Dr. THOMAS ARTHUR GREEN, on Sept. 11th. An Edinburgh graduate, he qualified in 1890 and took the M.D. with commendation in 1897. He was in practice first at Meltham in Yorkshire, where he was medical officer of health, but later he moved to Clifton. He took the fellowship of the Royal College of Surgeons of Edinburgh in 1905 and was appointed surgeon to out-patients, with charge of the ear, nose, and throat department, at the Bristol Royal Hospital for Women and Children. From the establishment of the 3rd South Midland Field Ambulance (T.A.) in 1908 Dr. Green was associated with its work, and he went overseas in March, 1915. He assumed command of the unit in 1916, and in the following year, with rank as lieut.-colonel, took it to Italy. In June, 1918, he was awarded the D.S.O., and he was several times mentioned in dispatches. In 1930 he retired and went to live in Huddersfield, but he returned to Clifton about a year ago. He was 69 years old.

Dr. WALTER GEORGE ROGERS was the son of F. G. A. Rogers, M.R.C.S., and was born at Wrestlingworth in Bedfordshire in 1874. After attending Derby and Warwick grammar schools he went to University College, Cardiff, and thence to Charing Cross Hospital for his clinical studies. Taking the L.S.A. in 1901, he settled in Chesham, Bucks. In 1912 he graduated as M.B. Lond. and his next years of practice were spent at Lutterworth. Finally he moved to Guildford, and it was there that he died, on Sept. 7th. Dr. Rogers was a commander of the Order of St. John of Jerusalem. He married the daughter of James Robinson of Alford, Lincs.

APPEAL FOR LONDON'S SPECIAL HOSPITALS.—On Oct. 12th thirty-three special hospitals in the London area will hold a combined collection to take the place of all the separate flag days and street collections which they would otherwise have held during the year. In May the general hospitals made a similar combined appeal to the public. About 20,000 voluntary workers will be needed if on Oct. 12th the hospitals are to succeed in raising at least the £30,000 which they used to collect during the whole year.

OPENING OF THE MEDICAL SCHOOLS

IN connexion with the opening of the session at the London medical schools the following arrangements have been made:—

Charing Cross Hospital

A post-graduate course for former students will be held on Oct. 2nd and 3rd. The annual dinner will take place on Saturday, Oct. 2nd, at the Café Royal at 8 P.M., with Lord Addison in the chair. The date for the prize-giving and inaugural address has not yet been fixed but it will probably be held later in October.

Guy's Hospital

On Friday, Oct. 8th, at 3 P.M., Sir Edward Poulton, F.R.S., will distribute the prizes and deliver the opening address. He will speak on evolution. The biennial dinner of the hospital will be held on Saturday, Oct. 30th, in the Connaught Rooms at 7 P.M., when Dr. John Fawcett will be in the chair.

King's College Hospital

On Oct. 5th Sir Alfred Webb-Johnson will give the inaugural address at 4.30 P.M. The title of his address will be "And Even Now." On Saturday, Oct. 23rd, and Sunday, Oct. 24th, there will be lectures and demonstrations open to all practitioners. The annual dinner of past and present students will be held on Oct. 23rd at the May Fair Hotel at 8 P.M., when Dr. J. A. Drake, the dean, will be in the chair.

London Hospital

A post-graduate course for former students of the hospital will be held from Oct. 20th to 23rd. The old students' dinner will take place on Oct. 21st, at 7.30 P.M., at the Trocadero Restaurant, with Dr. Charles Miller in the chair.

Middlesex Hospital

A post-graduate course for former students of the hospital will be held from Oct. 1st to 3rd. On Oct. 1st the annual dinner will be held at the Savoy Hotel at 7.30 P.M., and Dr. Douglas McAlpine will be in the chair.

Royal Free Hospital

On Friday, Oct. 1st, at 3.30 P.M., Mr. H. L. Eason, principal of the University of London, will deliver the inaugural address. The annual reunion dinner of the old students will be held on Dec. 2nd, with Mrs. Kinnell, chairman of the weekly board of the hospital, in the chair. There will be a week-end post-graduate course for former students of the hospital from Dec. 3rd to 5th.

St. Bartholomew's Hospital

On Friday, Oct. 1st, at 8 P.M., the old students' dinner will be held in the College Hall, Charterhouse-square, with Dr. C. M. Hinds Howell in the chair.

St. George's Hospital

On Saturday, Oct. 2nd, at 3 P.M., Mr. W. R. Halliday, LL.D., principal of King's College, London, will give the inaugural address at the annual prize-giving of this hospital. A short course for former students will be held from Sept. 30th to Oct. 2nd, and the annual dinner will take place at the May Fair Hotel on Saturday, Oct. 2nd, at 8 P.M. Mr. Ivor Back will take the chair.

St. Mary's Hospital

A post-graduate course will be held from Sept. 30th to Oct. 3rd, open to all medical practitioners without fee. The annual dinner of past and present students will take place at Claridge's Hotel on Saturday, Oct. 2nd, at 7.30 P.M., with Mr. V. Zachary Cope in the chair.

St. Thomas's Hospital

Dr. J. S. Fairbairn will preside at the old students' dinner, which will take place on Friday, Oct. 8th, at the Dorchester Hotel, at 7.45 P.M.

University College Hospital

On Tuesday, Oct. 5th, at 4 P.M., a reception will be held in the library of the medical school. The annual demonstrations for old students will take place on Oct. 7th and 8th, and the annual dinner will be held in the library of the medical school on Friday, Oct. 8th, at 7.30 P.M., with Dr. W. F. Addey in the chair. The annual dinner of the Women's Association will be held at the Langham Hotel at 8 P.M. on the same day, and Dr. Freda Kelly will preside.

Westminster Hospital

On Monday, Oct. 4th, at 3 P.M., the winter session will open at the Caxton Hall, Westminster, when Sir Seymour Hicks will deliver the inaugural address. He will speak on "The Doctor to the Patient's Eyes." The annual dinner of past and present students will take place at the Park Lane Hotel, W., on Saturday, Oct. 2nd, at 8 P.M., when Mr. A. F. MacCallan will be in the chair.

Royal Dental Hospital

Sir Cuthbert Wallace will preside over the prize distribution at the hospital on Oct. 5th at 8 P.M. The annual At Home will be held at the hospital on Nov. 20th, and the dinner of past and present students on the same evening at the Trocadero Restaurant at 7.30 P.M., with Mr. F. Coleman in the chair.

Further details of post-graduate courses will appear in due course in our Medical Diary.

MEDICAL NEWS

University of Oxford

Dr. J. H. Burn, professor of pharmacology in the University of London, who has been appointed to the chair of pharmacology in the university, will take up his duties on Oct. 1st.

Prof. Burn is 45 years of age. He was educated at Emmanuel College, Cambridge, and obtained a first class in Part II of the natural sciences tripos. During the late war he held a temporary commission in the Royal Engineers. He graduated as M.B. in 1920, was awarded the Michael Foster studentship, and was appointed to the staff of the Medical Research Council where he remained till 1925. In that year he took his M.D., gaining the Raymond Horton-Smith prize, and became one of the members of the advisory committee established under the Therapeutic Substances Act of 1925. On the inauguration of the pharmacological laboratories of the Pharmaceutical Society in 1926, he was appointed director, and he has been dean of the Society's college since 1933. He was a member of the 1932 Pharmacopœia Commission, acting as chairman of the biological standards subcommittee, and is secretary of the board of studies in pharmacology of the University of London. His publications include "Methods of Biological Assay" and "Recent Advances in Materia Medica."

Royal College of Surgeons of England

In connexion with the Buckston Browne dinner, which takes place in November, it is proposed to hold an exhibition of works of art by fellows and members of the college. If it can be arranged the exhibition will remain open, in one of the museum rooms, for about three weeks. Fellows and members who are willing to send some of their work are asked to communicate with Dr. John Beattie, Royal College of Surgeons of England, Lincoln's Inn-fields, London, W.C.2.

University of Birmingham

In connexion with the opening of the new session of the medical school post-graduate lectures will be given at the General Hospital and Queen's Hospital on Tuesday and Wednesday, Oct. 5th and 6th. Prof. R. T. Leiper, F.R.S., will present the prizes and give an address on Tuesday at 5 P.M., in the medical theatre, Edmund-street, and the annual dinner will be held at the Grand Hotel at 8.15 on the same evening.

University of Durham

At a convocation held on Sept. 11th the degree of M.D. was conferred on W. G. A. Swan.

Hexham War Memorial Hospital

On Sept. 11th Lord Grey opened a new operating-theatre at this hospital. To meet the cost another £2000 is still required.

National Smoke Abatement Society

The ninth annual conference of this society will be held at the Philosophical Hall, Leeds, from Sept. 30th to Oct. 2nd. The presidential address will be given by Dr. H. A. Des Voeux. The first session is to be devoted to a discussion on town-planning and smoke abatement. At the second session representatives from the regional committees, including Dr. R. Veitch Clark, Dr. Matthew Burn, Dr. W. M. Fraser, and Dr. J. Johnstone Jervis, will speak. Education and smoke abatement will be the subject discussed at the last session. Further information may be had from the secretary of the society, Chandos House, 64, Buckingham-gate, London, S.W.1.

Luigi Galvani

The bicentenary of the birth of Galvani will be celebrated from Oct. 18th to 20th at Bologna. He was born in that city on Sept. 9th, 1737, he was educated at its university, and he practised and taught there until his death in 1798.

Coal Utilisation Council

At the third National Coal Convention, to be held in Harrogate on Oct. 6th and 7th under the auspices of this council, the speakers will include Lord Horder, and Sir Frederick Sykes, chairman of the Miners' Welfare Committee.

Scientific Photographs and Films

The Association pour la Documentation Photographique et Cinématographique dans les Sciences will hold their annual conference in Paris from Oct. 7th to 9th. Further information may be had from Dr. C. Claoué, 39 rue Scheffer, Paris.

Invalid and Crippled Children's Society

The annual general meeting of this society will be held at its hospital (Balaam-street, Plaistow, London, E.) on Tuesday, Sept. 21st, at 11 A.M., under the presidency of Sir Reginald Kennedy-Cox. A further £5000 is still required for the proposed extensions of the hospital.

Courses in Dramatic Production

Sunday courses on dramatic production will be held again this autumn at the Everyman Theatre, Hampstead. There will also be courses in play-writing and play technique. Free tickets of admission are available for the Sunday afternoon performances of the drama courses. Further information may be had from Citizen House, Bath.

Intensive Course in Internal Medicine at Edinburgh

An eight weeks' intensive post-graduate course in internal medicine will be inaugurated in Edinburgh this autumn under the auspices of the executive post-graduate committee appointed by the University and Royal Colleges. The course will extend from Oct. 18th to Dec. 10th and the attendance will be limited to thirty-two. All the honorary physicians and assistant physicians on the staff of the Royal Infirmary will take part in the teaching in addition to the staffs of the departments for venereal diseases, radiology, and pathology, the University department for tuberculosis, the Royal Hospital for Sick Children, the Royal Hospital for Mental and Nervous Disorders, and the Western General Municipal Hospital. The medical men attending the course will be attached for ward work, in numbers not exceeding four, to the individual charges in the Royal Infirmary under the care of the eight physicians. There will be in addition four hours every day of coördinated teaching, the various departments of medicine being dealt with in successive weeks. During the first week, which will be devoted to cardiology, Dr. Rae Gilchrist will demonstrate methods of diagnosis from 10 to 11; Prof. W. T. Ritchie will hold clinics on cardiac cases from 11 to 12; applied demonstrations on radiology, morbid anatomy, and pathology will be given from 2 to 3; and Dr. John McMichael will discuss and demonstrate the physiology of the circulation from 4 to 5.

International Blood Transfusion Congress

The second International Blood Transfusion Congress will be held in Paris from Sept. 29th to Oct. 2nd. Dr. H. F. Brewer and Mr. P. L. Oliver have been appointed delegates by the British Red Cross Society, and Dr. Brewer will act as joint president of the session for free communications.

Psychiatry in Liverpool

Four lectures open only to medical graduates will be held at the Liverpool Psychiatric Clinic (1, Abercromby-square) on Wednesdays, Oct. 6th, 13th, 20th, and 27th. The lecturer will be Dr. S. Barton Hall and he will speak on psychological medicine from the standpoint of general practice. Further information may be had from the lecture secretary at the clinic.

East Suffolk and Ipswich Hospital

Sir John and Lady Ganzoni have given £1500 to cover the cost of the special equipment of the new orthopædic department at this hospital.

Caerphilly Miners' Hospital

It is twenty years since this hospital was opened and there are now 80 beds. The annual income exceeds £10,000, the cost of administration being about £165 per bed; during the last year unemployed workmen contributed £78 in weekly payments of a penny each.

Bristol Royal Infirmary

The bicentenary of the opening of this hospital will be celebrated on Oct. 22nd. The buildings and equipment will be open for inspection by the honorary staff, former students and nurses at 5 P.M., and a dinner will be held at 8 P.M. at the University Union (Victoria Rooms, Queens-road). Further information may be had from the hon. secretary of the bicentenary celebrations committee at the hospital.

Royal Sanitary Institute

A sessional meeting of the institute will be held on Friday, Oct. 1st, in the Town Hall, Llandudno, when Dr. D. A. Powell, principal medical officer of the King Edward VII Welsh National Memorial Association, Cardiff, will open a discussion on tuberculosis in Wales—a stock-taking. Dr. R. W. Dodgson, director of the Ministry of Agriculture and Fisheries Shellfish Research Station, Conway, will speak on the Conway mussel purification tanks, and on Saturday morning a visit will be made to the Station, Conway, for a demonstration and inspection of the tanks. Dr. D. E. Parry Pritchard will also read a paper dealing with a recent outbreak of bacillary dysentery.

Tavistock Clinic

A course of ten lectures for medical practitioners, on the neuroses in general practice, will be given at the Tavistock Clinic (Institute of Medical Psychology) on Thursdays at 8.30 P.M., beginning on Oct. 7th. The lecturers will be: Dr. W. J. O'Donovan (dermatological neuroses), Sir Walter Langdon-Brown (functional disorders of digestion), Mr. Aleck Bourne (gynæcological neuroses), Dr. J. L. Livingstone (respiratory neuroses), Sir Maurice Cassidy (cardiac neuroses), and Dr. W. Russell Brain (psychological manifestations of neurological disorders).

The next course of public lectures will be on the psychology of peace and war. It will open on Tuesday, Oct. 26th, at 6.15 P.M., and the speakers will include Dr. Leonard Brown, Dr. Karin Stephen, Prof F. C. Bartlett, F.R.S., and the Very Rev. W. R. Inge.

Courses on psychopathology and psychotherapy for medical practitioners have been arranged for the coming session and will include a five weeks' introductory course, systematic lectures, a clinical course, and a short special course suitable for those taking the D.P.M. A second year's course designed to follow the clinical one has been organised for medical men who intend to specialise in psychotherapy, and there will also be a course on the treatment of childhood disorders. Prof. C. G. Jung of Zürich will give five seminars from April 4th to 8th. Courses will also be held for teachers, educationists, and the clergy. Further particulars about all these courses and lectures may be had from the educational secretary of the institute, Malet-place, London, W.C.1.

INFECTIOUS DISEASE

IN ENGLAND AND WALES DURING THE WEEK ENDED SEPT. 4TH, 1937

Notifications.—The following cases of infectious disease were notified during the week: Small-pox, 0; scarlet fever, 1531; diphtheria, 1084; enteric fever, 51; pneumonia (primary or influenzal), 351; puerperal fever, 30; puerperal pyrexia, 149; cerebro-spinal fever, 7; acute poliomyelitis, 35; encephalitis lethargica, 1; dysentery, 158 (152 in Luton); ophthalmia neonatorum, 94. No case of cholera, plague, or typhus fever was notified during the week.

The number of cases in the Infectious Hospitals of the London County Council on Sept. 10th was 2658, which included: Scarlet fever, 597; diphtheria, 696 (diphtheria carriers, 19); measles, 128; whooping-cough, 439; puerperal fever, 17 mothers (plus 6 babies); encephalitis lethargica, 283; poliomyelitis, 6. At St. Margaret's Hospital there were 21 babies (plus 8 mothers) with ophthalmia neonatorum.

Deaths.—In 124 great towns, including London, there was no death from small-pox or from enteric fever, 7 (1) from measles, 1 (0) from scarlet fever, 15 (2) from whooping-cough, 21 (3) from diphtheria, 54 (14) from diarrhœa and enteritis under two years, and 14 (2) from influenza. The figures in parentheses are those for London itself.

Greater London reported a death from enteric fever. Liverpool had 7 deaths from whooping-cough. Diphtheria was fatal in 15 great towns: in 2 cases each at Bradford, Hull, and Manchester. Six deaths from diarrhœa were reported from Birmingham, and 5 from Liverpool. There were 3 deaths from measles at Sunderland.

The number of stillbirths notified during the week was 267 (corresponding to a rate of 40 per 1000 total births), including 37 in London.

Births, Marriages, and Deaths

BIRTHS

BEER.—On Sept. 5th, the wife of Dr. Sharman Beer, of Thame, Oxon, of a daughter.

DUNNILL.—On Sept. 7th, at Bexhill-on-Sea, the wife of Dr. Dennis Dunnill, of a daughter.

FURBER.—On Sept. 6th, at Reading, the wife of Dr. Brian Furber, of a son.

KENNEDY.—On Sept. 9th, at Broumana, Lebanon, a son to Muriel Olwen, wife of Professor Walter P. Kennedy, Royal College of Medicine, Baghdad.

KERR.—On Sept. 6th, at Southampton, the wife of W. L. Kerr, M.B. Lond., of a daughter.

LUPTON.—On Sept. 12th, the wife of C. A. Lupton, F.R.C.S. Eng., of Farnborough, Hants, of a daughter.

SHIPMAN.—On Sept. 7th, at the Walker Hospital, Simla, India, the wife of Capt. R. T. Shipman, R.A.M.C., of a daughter.

MARRIAGES

BOLTON—BUCKETT.—On Sept. 11th, Donald Herbert Bolton, M.R.C.S. Eng., to Barbara Mary, daughter of Mr. and Mrs. John Buckett, North End Farm, Hursley.

PEDLEY—NORRISH.—On Sept. 1st, at Hankow, China, James Cecil Pedley, M.R.C.S. Eng., of the Borden Memorial Hospital, Kaolan, China, to Betty Eileen, eldest daughter of Mr. and Mrs. W. E. Norrish, of Enfield, Middlesex.

DEATHS

COURTNEY.—On Sept. 5th, at the Royal Free Hospital, Harold George Shackleford Courtney, M.R.C.S. Eng.

FALCONER.—On Sept. 12th, at Hastings, James Forsyth Falconer, M.B. Eng., late of Brixham, South Devon.

GOLDSMITH.—On Sept. 13th, at Savernake Hospital, Marlborough, Colonel George Mills Goldsmith, C.B.E., late R.A.M.C., aged 61.

HILDRETH.—On Sept. 11th, in a London nursing-home, Harold Crossley Hildreth, D.S.O., O.B.E., late Lieut.-Col., R.A.M.C., of White Walls, Colchester.

LEAH.—On Sept. 3rd, at Stonehouse, Plymouth, Thomas Noy Leah, M.B. Lond., aged 62.

NASH.—On Sept. 9th, Charles Nash, M.R.C.S. Eng., of Horndean, Hampshire.

ROGERS.—On Sept. 7th, Walter George Rogers, M.B. Lond., Commander of the Order of St. John of Jerusalem, of Guildford.

THURSTON.—On Sept. 10th, at Bournemouth, Daniel Thurston, M.B., formerly of Endsleigh-gardens, London, W.C.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.

NOTES, COMMENTS, AND ABSTRACTS

HEAD INJURIES ATTRIBUTABLE TO BOXING *

BY C. E. WINTERSTEIN

BOXING is one of the most popular sports, but it has rarely been realised that punches and their consequences may provide the medical investigator with interesting material for the study of head injury. Unlike accidents these injuries are caused by trauma always of the same kind and acting with almost laboratory exactness. Everything occurs in the presence of experienced spectators, such as the trainer, manager, and the referee. Film records are taken. No police inquiries follow to interfere with psychological observation; there is no question of compensation, so that the possibility of a compensation neurosis is excluded. These points make boxing a model experiment for the study of traumatic head injury, and justify, I hope, a short abstract of the investigation of about fifty professional boxers carried out by Dr. E. Guttmann and myself in Dr. R. D. Gillespie's department at Guy's Hospital.

The consequences of head injuries in boxing divide themselves clearly into two groups: (1) the immediate effects of a single punch; and (2) the remote effects of innumerable blows taken on the head during many years of fighting.

THE IMMEDIATE EFFECTS OF A SINGLE PUNCH

With regard to the first group, we concentrated on the typical knock-out which is produced by a punch on a point half an inch to either side of the tip of the jaw, approximately in the region of the mental foramen. It is generally agreed that however much individual sensitivity may vary, it is easier to cause a knock-out by hitting this point than any other point of the skull. The knock-out syndrome consists mainly of a varying period of unconsciousness, loss of muscle tone, and alteration of posture and of deep reflexes.

By far the most interesting psychological phenomena accompanying the knock-out are the various types of amnesia. The least complicated form of amnesia is that which does not extend beyond the actual time of unconsciousness—i.e., a clearly defined gap of memory lasting from the time the punch was received until that of apparent recovery. The second group has a retrograde amnesia as well; for instance, a boxer may say he did not feel the knock-out punch, but remembers seeing it coming. Another boxer, after having been knocked out, may have forgotten that he had ever fought and remain under the impression that he is still to do so. These examples of retrograde amnesia of varying length do not differ in character from those in other head injuries, but the division of a boxing match into three-minute rounds sometimes allows a very accurate measurement of the amnestic period. In a third and most remarkable group, there is combined with a retrograde amnesia an anterograde amnesia—i.e., an amnesia covering the time of unconsciousness, but spreading over a period when to all outward appearances normal activity has long been resumed. This type may best be illustrated by some personal accounts given us by boxers:—

The last thing one boxer remembers is the bell at the end of the fourth round; then everything went blank. He next remembers arriving home that evening and seeing his mother; later he hears from his friends that he won the fight, his opponent being disqualified for hitting him after the bell. His friends report that he was picked up by the referee after having been on the floor a few seconds; and that without any assistance he left the ring, washed and dressed himself, fetched his money from the manager, went to the tram and took four tickets for himself and for his three friends. Another boxer was knocked down for a short count in the first round. He next remembers standing under the shower and his father telling him that he won the fight in the third round on a technical knock-out, having fought like a fighter and not at all like the scientific boxer he usually was. In a third case, full recollection began in the train the morning after the fight in which he was knocked out in the first round. He inquired what town he was going to. In yet another case a boxer caught a heavy punch in the first round but did not go down. He next remembers sitting in his corner, the roar of the crowd suddenly becoming audible, and seeing a sign going up marked "seventh round," whereas he was under the impression that it was only the second round; he won his fight on points. As a last example there is the case of a boxer who remembers the fight only up to the fifth round. Recollection came back in the dressing-room, his first thought being, "Did I fetch my money." In spite of many indirect questions he was unable that evening to find out from his friends what the result of the fight was. As he did not wish to appear stupid by asking directly, he had to wait for next morning's paper to read of his victory on points.

Nearly half the boxers we examined described such instances of anterograde amnesia. Many were deeply impressed by this experience, and it was an amnesia of this type that is said to have made Gene Tunney, former heavy-weight champion of the world, first think of retiring.

It was recently suggested that this anterograde amnesia, not unknown in other sports, might really be a retrograde amnesia produced by a punch received much later in the fight which the boxer did not remember. This explanation, however, is not applicable to the amnesia covering the period long after the end of the match. This anterograde amnesia is not likely to be the repression of an unpleasant experience, since it is found not only where the fight ended in defeat but also in cases where the boxer won his fight on points or even by a knock-out. Moreover, it does not seem justifiable to put down an anterograde amnesia to an emotional narrowing of consciousness due to concentration on the fight, for the amnesia extends far beyond the period of actual fighting.

It must be assumed that during this period, which he cannot recall later on, the boxer is in a state of "altered consciousness," a state which closely resembles a certain type of epileptic twilight state. The evidence of the existence of a "post-traumatic" twilight state seems to be of psychological, social, and forensic importance.

THE REMOTE EFFECT OF INNUMERABLE BLOWS

Fundamentally different from the phenomena just described is the picture of the "punch-drunk" boxer. Among the boxers we saw there was a disproportionately large number of such cases, because our investigations had become known under this heading.

Amongst the physical signs shown by these boxers, the broken nose and the so-called cauliflower ear are the most striking. Neurologically the equilibrium seems to be first and most severely affected. Romberg's sign is often positive. The walk is unsteady, sometimes ataxic. Articulation is sometimes disturbed;

* A paper communicated to the Section of Neurology and Psychological Medicine at the annual meeting of the British Medical Association in Belfast on July 21st, 1937.

speech may be slurring or hesitant. A vacant look in the eye completes the analogy with alcoholic intoxication and justifies the term "punch-drunk," long familiar to the boxing world. Most of those badly affected showed an impairment of intelligence. A bad memory for recent events was very obvious. A characteristic sign of mental dullness is the ease with which these men have adjusted themselves to their fall from a comparatively brilliant position to that of poorly paid occasional labour in ordinary life. Some have great difficulty in concentrating and are garrulous; others again may be paranoid and suspicious; others appear over-cheerful and inclined to talk about the punch-drunkenness of their colleagues. Their interest and boastfulness often seem to hide and over-compensate for their true feelings. Low intelligence is certainly a strong predisposing factor in the acquisition of punch-drunkenness. But some of the men whom I knew ten years ago leave me in no doubt that their deteriorated condition to-day is due to the punches received during fighting. One might think that the sensitive boxer who is easily knocked out is in the greatest danger of becoming punch-drunk. But according to Parker's cases and our own observations, just the opposite seems true. It is not the brilliantly scientific boxer but the fighter who responds to the crowd by dropping his defence, and giving a demonstration of reckless courage, who in his prime was strong enough to take all punches for nine rounds in order to win in the tenth by his superior physical strength—it is he who is the most likely to end punch-drunk.

It is a highly controversial question whether the resistance against punches increases or decreases as time goes on. From what we have seen—and many boxers agree—a punch-drunk boxer is more difficult to knock out. He tumbles about the ring unable to defend himself properly but remains on his feet taking every punch until the referee stops the fight. This suggests that the knock-out may be conceived as a protective reflex which has vanished in such cases.

There seems to be no doubt that the cause of punch-drunkenness is continued hammering, and, as Parker thinks, multiple small injuries to the brain affecting different systems at the same time may be responsible for the varied clinical pictures. Unfortunately no histological findings in the brain of punch-drunk boxers are available to confirm the clinical findings. Generally the symptoms do not increase after the repeated injuries are stopped—conversely there are remissions and recoveries if the boxer gives up fighting at an early stage.

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THE DISCOVERY OF CHLOROFORM—BY TELEVISION

IF we were less thrilled than we might have been last week at the effect produced by chloroform on Dr. James Young Simpson, his two enthusiastic disciples, and his docile niece, as seen by television, it was probably because the outcome of his experiments was already well known to us. Moreover attention was distracted by the effort to believe that the resonant voices really belonged to the diminutive figures moving through a very small ambit a long distance away. The sensation produced was rather like that of a souvenir post card of a classical picture, which we ourselves buy to send away rather than to keep. The impression must, however, have been fairly vivid, because we were conscious of a lively apprehension when the dope was inhaled in the sitting posture, a procedure which anæsthetists now regard as even more dangerous than taking it lying down. We were duly humbled at the reminder in the play that our journal played the rôle traditionally ascribed to orthodox medicine when new ideas are put forward.

PAPWORTH VILLAGE SETTLEMENT

THE smooth working of the new surgical unit at Papworth is remarked on in the Settlement's annual report for 1936 and a tribute is paid to the work of the late H. P. Nelson, who was largely responsible for its inception. In the ear, nose, and throat unit an electrical method has been developed for anæsthetising the larynx, and a new nerve-block devised for the relief of laryngeal pain. The work of the collapse therapy unit has increased and 714 refills were given during the year. The department of radiology also reports that its work is growing, chiefly because of the necessity of close X ray control of patients of the new surgical unit before and after thoracic operations. The bacteriological and the biochemical departments, in collaboration with Mr. L. J. Harris, Sc.D., are undertaking a survey of the vitamin-C excretion in various clinical grades of tuberculosis (see *Lancet*, July 24th, 1937, p. 183). The industrial section has adopted the word "Pendragon" as its registered trade mark and in future all Papworth products will be stamped with it.

HOSPITAL INFORMATION

SOME particulars of staffing arrangements and facilities provided for "paying" or "private" patients in six London and ten provincial hospitals are supplied in an addendum to memorandum No. 62 (which dealt with accommodation) by the Central Bureau of Hospital Information. The replies set out show such discrepancies that it is unlikely to be of much use to authorities who are anxious to reap the benefit of collective experience. Since the hospitals are identified only by letters there is no means of discovering even indirectly whether those who follow one of the plans suggested under each heading are more efficiently run or more popular than those following another. There is general agreement on the desirability of supplying mainly single-bedded rooms, though three hospitals protest that patients often dislike to be alone. Another point of agreement seems to be that two-bedded rooms are both less popular and less satisfactory than wards with four or six beds. The minimum dimensions deemed suitable for a single room vary between 90 and 195 square feet. Only one of the provincial hospitals recommends the provision of a telephone for each patient, while five of the six London ones, doubtless from experience of patients' demands, say that at least a connexion should be fixed in each room. A silent indicator light as the only system by which the patient can secure attention from the staff is held to be unsatisfactory by all but two hospitals, and twelve hospitals regard the provision of a separate operating-theatre as necessary or highly desirable. Opinions are divided almost evenly between the systems of charging the same fee for each single room or of having a scale of fees according to the size and position of the room occupied; a similar division of opinion is shown on the question whether it is necessary to exclude probationers and employ a complete staff of trained nurses. Four only of the hospitals allow the patient to be attended by his own doctor, and three of these insist on any operative treatment being performed by a member of the honorary staff.

The information in this memorandum would have been more valuable if the number of hospitals approached had been stated. In the London area alone about sixty general hospitals of different

sizes have pay-beds, and the six whose answers are recorded may not be a fair sample.

The Bureau has issued also, as Memorandum No. 113, some useful particulars of staff and work done in 1935 in 21 maternity hospitals in England (18) and Scotland (3). These leaflets are obtainable for 2½*d.* and 2*d.* (No. 113) from the offices of the Bureau at 12, Grosvenor-crescent, London, S.W.1.

CANCER CONTROL IN SCOTLAND

IN the fourth annual report of the Cancer Control Organisation of Edinburgh and South-east Scotland it is recorded that no death from occupational cancer has occurred for twenty years among the shale-oil miners of Broxburn. This is an example of effective prophylaxis that should be noted by the pessimists. In another contribution to this report, the radiologist of the Royal Infirmary, Edinburgh, reverts to the thorny question of methods of cancer control among the general public. In his view, "it would seem worth while that every one, as soon as he approaches the cancer age, should be subjected to periodic medical examination." The pathologist is here warned of the pitfalls which beset his interpretations; it might have been well to say bluntly that he should hasten to make himself acquainted with the histological appearances brought about in cancers by irradiation.

The clinical division into stages or grades of tumours, even if accessible to examination, still involves an error of nearly 40 per cent. Some of the tables present melancholy reading. The gap between what are recognised conventionally as stage I and stage II cancers in the matter of survival is wide and might be lessened by earlier diagnosis. Now that the sixth year of record of results has been reached, there would be convenience and value in introducing grand totals for the several defined stages of cancer.

Observations set out under the several headings of a statistical survey of cancer of the various localities of the body are material to diagnosis, prognosis, and treatment. Articles on diagnosis of swellings of the neck with special reference to malignant disease and on mammary cancer are of special interest. The latter, based on a survey of 608 cases, is a mine of information. The chairman of the organisation, which is affiliated to the British Empire Cancer Campaign, sets out the policy aimed at as "the careful investigation of cancer in all its aspects and assistance in the method of adequate treatment to all its victims."

MEDICAL HISTORY IN THE NETHERLANDS

THE scheme whereby a historical medical society in the Netherlands select for publication portions of the records of their medical ancestors provides us with delightful reading. That they may be the more widely appreciated each item is translated from the original language, for the most part naturally Dutch, into either English, French, or German. Where the original is in Latin the translation is into Dutch. Each item is prefaced with a brief biographical notice of its author, and in nearly all cases the editors have been successful in unearthing a portrait

In the thirteenth volume[1] most of the selections are letters from the distinguished physicians of the Netherlands to their colleagues at home or abroad, and in date they range from 1550 to 1870. Among other names less familiar to the Englishman are the famous ones of Vesalius, Boerhaave, and Descartes. A series of letters from five distinguished physicians to one another discuss the recent discovery by Harvey of the circulation of the blood, and Descartes' comments are a curious mixture of deep appreciation of the discovery and an attempt to reconcile it with the ancient views. But to us the gem of the collection is the letter "De Scorbuto" of Pieter van Foreest, written in 1590 to his nephew then embarking on a medical career. No more noble or inspiring an introduction to the science and art of medicine has ever been penned. Dr. van Andel writes an extremely interesting introductory essay to this volume of letters, emphasising the great importance to medicine of the habit of epistolary consultation before the art of printing had made books sufficiently cheap to be within the reach of the doctor.

The fourteenth volume is no less interesting, though of a completely different cast. It is entirely made up of selections from the writings of three distinguished physicians. Gulielmus Piso who went to Brazil in the service of the Dutch West Indian Company in 1637 wrote a "natural history" of the country. The portions selected for reprinting here are his chapters on diarrhœa, dysentery, and Indian lues, and on the herb ipecacuanha. The second physician is Wilhem ten Rhyne who served the Dutch East Indian Company for many years in Batavia, and in 1687 published a treatise on Asiatic leprosy, which embodied his experience of the disease, and rendered good service to the profession by the careful distinction between the various forms of leprosy and the emphasis on the need for accurate diagnosis from the numerous affections which were then confounded with it. The larger part of this volume is however occupied with a reprint of the "Treatise about the most excellent herb Tea" by Cornelis Bontekoe. This was originally published in 1678. It is written in Dutch, but the admirable usage of the society has provided an English translation so good that but for an occasional lapse it might pass for an original English document. The subject does not at first sight seem to offer any great scope for the serious attention of a physician, but Bontekoe was in many ways a genius and in this treatise there is scarcely a subject of social or medical importance on which he does not touch. Some opponents of tea-drinking had maintained that the habit made women barren. For Bontekoe that is sufficient text for a long dissertation on marriage, the birth and education of children, and the habit of birth control, which seems from his account to have been not uncommon in his time. "It would hardly be believed," he says, "that a man or a woman could be so depraved . . . and I know an example of this impious aversion to fertility so remarkable and which strikes me so much that I dare not tell it." The whole treatise is filled with pungent and extremely modern comment upon human life, and deserves to be published in its entirety in this country. The society is to be congratulated on its energy, its methods of publication, and above all on its good fortune in having ready to its hand an apparently inexhaustible supply of excellent material, editors, and translators.

[1] Opuscula Selecta Neerlandicorum de Arte Medica. Fasciculi tertius-decimus et quartus-decimus, quos Curatores Miscellaneorum quae vocantur Nederlandsch Tijdschrift voor Geneeskunde collegerunt et ediderunt. Amstelodami Sumptibus Societatis. 1937. Vol. 13, pp. 307; Vol. 14, pp. 465.

ECONOMICAL COOKERY

Dr. Elwin Nash, with the assistance of grants from the Carnegie Trustees and a team of highly trained cookery experts, has set himself[1] to provide guidance for the housewife of limited means. He has aimed at the inclusion in his dishes of sufficient of first-class protein, which is apt to be lacking in the average diet, and has kept prices down by using the less fashionable cuts of meat, scrap bacon, biscuit dust, and other cheap materials. Flavours have been made strong throughout to accord with working-class tastes, but Dr. Nash has sampled all of his dishes and has lived to tell the tale. The book covers all branches of cookery, including invalid cookery, as well as the arts of buying and storing, and most of the recipes are new. A possible improvement would be a statement at the top of each recipe of the time taken to

[1] Dr. Nash's Cookery Book. London: Simpkin Marshall. 1937. Pp. 183. 6*d.*

cook the dish and the number of people for whom it is intended, but the directions are in general clear and should help the reader to sense varied attractive and economical meals for her family.

Appointments

BISHOP, J. C., M.B. Birm., Resident Surgical Officer at the Children's Hospital, Birmingham.
HOWARTH, RICHARD, M.D. Edin., D.L.O., Hon. Aural Surgeon to the Prince of Wales's Hospital, Plymouth.
HUNTER, T. A., M.B. Camb., M.R.C.P. Lond., Hon. Medical Registrar to the Prince of Wales's Hospital, Plymouth.
MACLENNAN, H. R., M.D. Glasg., M.C.O.G., Senior Assistant Gynæcologist at the Victoria Infirmary, Glasgow.
PARRY, RUPERT, M.B. Lond., F.R.C.S. Edin., Hon. Ophthalmic Surgeon to the Cardiff Royal Infirmary.
STERN, E. S., M.D. Camb., M.R.C.P. Lond., D.P.M., Deputy Medical Superintendent at the City Mental Hospital, Humberstone, Leicester.

Vacancies

For further information refer to the advertisement columns

Albert Dock Hosp., Connaught road, E.—Res. M.O., at rate of £110.
Aylesbury, Royal Buckinghamshire Hosp.—Sen. and Jun. Res. M.O.'s, £200 and £150 respectively.
Ayr, Glengall Hosp. for Mental Diseases.—Jun. Asst. M.O., £300.
Birmingham Children's Hosp.—Res. and Asst. Res. M.O.'s, £175 and £125 respectively.
Birmingham Royal Cripples Hosp.—Res. H.S., at rate of £200.
Blackburn, Queen's Park Hosp. and Institution.—Res. Jun. Asst. M.O., at rate of £150.
Bradford Royal Infirmary.—Two H.P.'s and four H.S.'s, each at rate of £150.
Brighton Municipal Hosp.—Third Res. Asst. M.O., £300.
Bristol General Hosp.—Res. Surg. O. and Reg., £200.
Bristol Royal Infirmary.—Sen. Hon. Anæsthetist.
Burnley, Victoria Hosp.—H.P., at rate of £150.
Cambridge, Addenbrooke's Hosp.—H.P., at rate of £130.
Central London Throat, Nose and Ear Hosp., Gray's Inn-road, W.C.—Third Res. H.S., at rate of £75. Also Hon. Assts. in the Out-patient Dept.
Chester, Barrowmore Tuberculosis Sanatorium and Settlement.—H.P., at rate of £150.
Coventry, Municipal General Hosp.—Two Asst. Res. M.O.'s, each £250–£300.
Croydon County Borough.—Asst. M.O. for Obstetrics, £300.
Dewsbury and District General Infirmary.—Sen. H.S., £200.
Doncaster Royal Infirmary.—H.P., £175.
Dreadnought Hosp., Greenwich, S.E.—Receiving Room Officer, at rate of £200.
Dublin City Skin and Cancer Hosp., Hume-street.—Deep X Ray and Radium Therapist, £500.
Durham C.C. Education Dept.—Asst. School Oculist, £500.
Ealing, Borough.—Deputy M.O.H., £750.
Eastbourne, Princess Alice Memorial Hosp.—Res. H.S., £150.
Elizabeth Garrett Anderson Hosp., Euston-road, N.W.—Clin. Assts. in Med. and Surg. Depts. Hon. Physician to Children's Dept. Med. Reg., £100.
General Lying-in Hosp., York-road, S.E.—Jun. Res. M.O. and Anæsthetist, at rate of £100.
Glasgow Corporation Mental Hosp. Service.—Jun. Asst. Phys. for Hawkhead Mental Hosp., £325.
Guildford, Royal Surrey County Hosp.—H.P., at rate of £150.
Hampstead General and N.W. London Hosp., Haverstock Hill, N.W.—Cas. M.O. for Out-patient Dept., at rate of £100.
Hosp. for Sick Children, Great Ormond-street, W.C.—Res. Surg. O., £200. Also Res. H.P. and Res. H.S., each at rate of £100.
Hospital of St. John and St. Elizabeth, 60, Grove End-road, N.W.—Res. H.S., at rate of £75.
Hove General Hosp.—Sen. Res. M.O., £150.
Hull Corporation Health Dept.—Asst. M.O.H. for Port Sanitary Work, £600.
Hull Royal Infirmary.—Second Cas. O., at rate of £150.
Infants Hosp., Vincent-square, Westminster, S.W.—Pathologist, £700. Also H.P., at rate of £100.
Leamington Spa, Warneford General Hosp.—H.P. and H.S., each at rate of £150. Also Cas. O. and Jun. H.S., at rate of £150.
Liphook, Hants, King George's Sanatorium for Sailors.—Asst. M.O., at rate of £200.
Liverpool, City.—Res. Asst. M.O.'s, each £250.
London Chest Hosp., Victoria Park, E.—H.P., at rate of £100.
London and Counties Medical Protection Society, Ltd., Victory House, Leicester-square, W.C.—Secretary, £1250.
London County Council.—Two Part-time Obstetricians and Gynæcologists, £800 and £600. Asst. Pathologist, £650. Asst. M.O.'s, Grade I, £350. Asst. M.O.'s, Grade II, £250. Also Temp. Dist. M.O.'s, £222 10s. to £135.
London Homœopathic Hosp., Great Ormond-street, W.C.—Physician for Diseases of Children.
London Hosp., E.—Two Hon. Asst. Dental Surgeons.
London Jewish Hosp., Stepney Green, E.—Res. M.O. and H.P., at rate of £150.
London Lock Hosp., 283, Harrow-road, W.—Res. M.O. to Female Depts., at rate of £175.
Maidstone, Kent County Ophthalmic and Aural Hosp.—Sen. and Jun. Ophth. H.S.'s, at rate of £250 and £200 respectively.
Manchester Ear Hosp., Grosvenor-square.—Res. H.S., £120.
Manchester, Lake Hosp. and Darnton House, Ashton-under-Lyne.—Jun. Res. M.O., at rate of £225.
Manchester, Monsall Hosp. for Infectious Diseases.—Two Res. Asst. M.O.'s, each at rate of £250.
Mansfield, Harlow Wood Orthopædic Hosp.—H.S. at rate of £200.
Middlesbrough, North Riding Infirmary.—Hon. Dental Surgeon.
Middlesex County Council.—Asst. M.O., £600. Three Res. Asst. M.O.'s, each £400. Also Res. Cas. M.O.'s, each £350.
National Hosp., Queen-square, W.C.—Hon. Dental Surgeon. Hon. Asst. Ophth. Surgeon. Also Refraction Officer, 1 guinea per session.
Oxford, Wingfield Morris Orthopædic Hosp., Headington.—Res. H.S., £100.
Plaistow Fever Hosp., E.—Sen. Res. M.O., £350.
Preston and County of Lancaster Royal Infirmary.—H.S., at rate of £150.
Reading, Royal Berkshire Hosp.—H.P., H.S. to Special Depts., and H.S., each at rate of £150.
Royal London Ophthalmic Hosp., City-road, E.C.—Two Out-patient Officers, each £100. Also Hon. Asst. Phys.
Royal Naval Medical Service.—Medical Officer.
Royal Northern Hosp., Holloway, N.—Cas. O., 4 gns. a week. Also Res. M.O., £370.
Royal Waterloo Hosp. for Children and Women, Waterloo-road, S.E.—Res. Cas. and Orthopædic H.S., at rate of £150.
Ruthin Castle.—Physician, £200.
St. John's Hosp., Lewisham, S.E.—Clin. Asst. to M.O. in charge of the Electrical Massage Dept. Also Med. Reg. to Out-Patient Dept., each 50 guineas.
St. Mary's Hosp. for Women and Children, Plaistow, E.—Res. Surg. O. and Res. H.P., at rate of £155 and £150 respectively. Also Hon. Dermatologist.
St. Thomas's Hosp. Medical School, S.E.—Sen. Demonstrator of Anatomy, £400.
Salford Royal Hosp.—Hon. Dermatologist.
Salisbury General Infirmary.—H.S., at rate of £125.
Scarborough Hosp.—Two H.S.'s, each at rate of £150.
Smethwick County Borough.—Sen. Asst. M.O.H. and Asst. School M.O., £650.
South Mimms, Clare Hall County (Tuberculosis) Sanatorium.—Res. Asst. M.O., £400.
Taunton and Somerset Hosp.—H.P., at rate of £100.
Victoria Hosp. for Children, Tite-street, Chelsea, S.W.—H.S., at rate of £100.
Wigan, Royal Albert Edward Infirmary and Dispensary.—Res. Med. and Surg. Officer and Reg., £250. Also Hon. Asst. Surgeon.
Willesden Municipal (Fever) Hosp. Brentfield-road, N.W.—Res. M. O., £250.
Winchester, Royal Hampshire County Hosp.—H.S., at rate of £125.
Wolverhampton Royal Hosp.—H.S., at rate of £100.
Worthing Hosp.—H.P., at rate of £130.

The Chief Inspector of Factories announces vacancies for Certifying Factory Surgeons at Brynmawr (Brecon), Ashby-de-la-Zouch (Leicester, and Cannock (Staffordshire).

Medical Diary

Information to be included in this column should reach us in proper form on Tuesday, and cannot appear if it reaches us later than the first post on Wednesday morning.

SOCIETIES

HARVEIAN SOCIETY OF LONDON.
THURSDAY, Sept. 23rd.—8.30 P.M. (26, Portland-place, W.), Dr. R. M. Fry: Puerperal Sepsis.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

UNIVERSITY OF GLASGOW.
TUESDAY, Sept. 21st.—4.30 P.M. (Tennent Memorial Building, Church-street), Dr. John Marshall: Diabetes.

BRITISH POSTGRADUATE MEDICAL SCHOOL, Ducane-road, W.
WEDNESDAY, Sept. 22nd.—Noon, clinical and pathological conference (medical). 3 P.M., clinical and pathological conference (surgical).
THURSDAY.—3 P.M., operative obstetrics.
FRIDAY.—3 P.M., clinical and pathological conference (obstetrical and gynæcological).
Daily, 10 A.M. to 4 P.M., medical clinics, surgical clinics, obstetrical and gynæcological clinics and operations, and refresher courses for panel practitioners.

HOSPITAL FOR EPILEPSY AND PARALYSIS, Maida Vale, W.
THURSDAY, Sept. 23rd.—3 P.M., Dr. S. Nevin: demonstration

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION, 1, Wimpole-street, W.
MONDAY, Sept. 20th, to SUNDAY, Sept. 26th.—THE INFANTS HOSPITAL, Vincent-square, S.W., all-day course in children's diseases (suitable for D.C.H. candidates).—WEST END HOSPITAL FOR NERVOUS DISEASES, Gloucester-gate, N.W., afternoon M.R.C.P. course in neurology.—ROYAL CHEST HOSPITAL, City-road, E.C., Mon., Wed., and Fri., 8 P.M., advanced course in chest and heart diseases.—NATIONAL TEMPERANCE HOSPITAL, Hampstead-road, N.W., Tues. and Thurs., 8 P.M., clinical and pathological M.R.C.P. course.—ROYAL WESTMINSTER OPHTHALMIC HOSPITAL, High Holborn, W.C., Sat. and Sun., course in ophthalmology.—Courses are open only to members of the fellowship.

MANCHESTER ROYAL INFIRMARY.
FRIDAY, Sept. 24th.—4.15 P.M., Dr. T. H. Oliver: demonstration.